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HOUGH'S
AMERICAN
WOODS.
PART X.

THE
AMERICAN WOODS,

EXHIBITED BY ACTUAL SPECIMENS

AND WITH COPIOUS EXPLANATORY TEXT,

BY

ROMEYN B. HOUGH, B. A.

PART X.

REPRESENTING TWENTY-FIVE SPECIES

BY

TWENTY-FIVE SETS OF SECTIONS.

GENERAL INDEX, PARTS I-X.

LOWVILLE, N. Y., U. S. A.

PUBLISHED AND SECTIONS PREPARED BY THE AUTHOR.

1904.

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By ROMEYN B. HOUGH.

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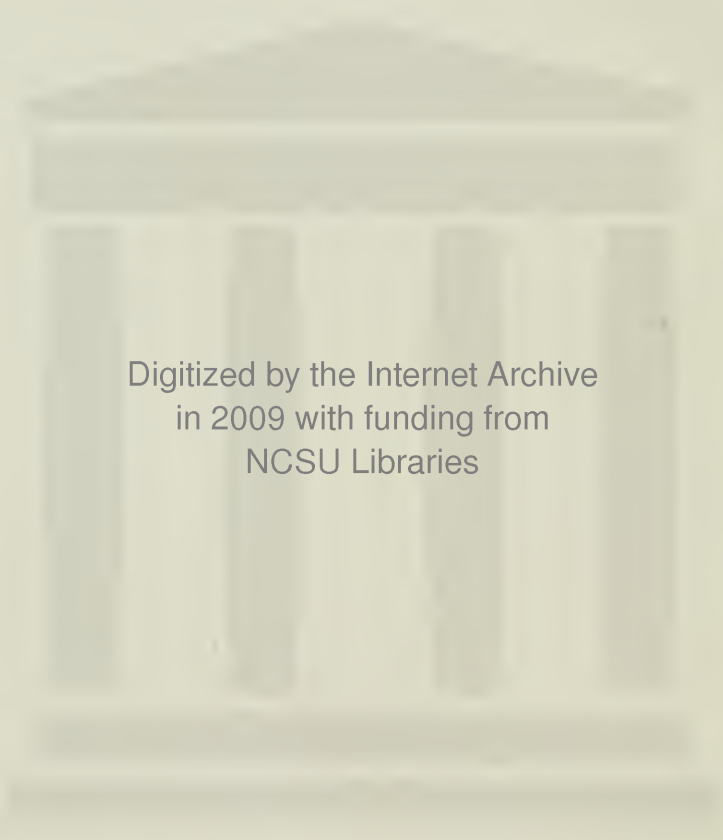
TO

William Thompson Davis,

OBSERVER AND LOVER OF NATURE,

THIS TENTH VOLUME OF AMERICAN WOODS

IS DEDICATED AS AN EXPRESSION OF AFFECTIONATE ESTEEM



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PREFACE TO THE SERIES.

The necessity of more generally diffused information concerning the variety and importance of our forest trees is justification enough for the appearance of this work, especially at this day, when the demands of Forestry in this country are constantly more and more keenly felt. The work was undertaken at the suggestion of my father, whose intense interest in Forestry, and a kindred taste, at once gave me inspiration to the work. It was entered upon with the expectation of his valuable companionship and counsel during its progress, but, alas ! that I was destined to have only at the outset, and, while I was then left ever to mourn the loss of a kind father, companion and teacher, the reader must fail to find in these pages that value and finish which his mind would have given them.

Among the happiest pictures of my memory are those in which I see my father's delight, as I would show to him, from time to time, my successful progress in devising a way of making the sections for this work, and if only for the happiness which its appearance would have caused him, could he have lived until this day, I have felt duty-bound to go on with it, even though left to do it alone.

The work is the outgrowth of one, of somewhat similar plan, proposed by my father some years since, but which he did not carry into effect. Its design is primarily and principally to show, in as compact and perfect a manner as possible, authentic specimens of our American woods, both native and introduced. For that end three sections, respectively transverse, radial and tangential to the grain (see Glossary), are made of each timber, sufficiently thin to allow in a measure the transmission of light, and securely mounted in well made frames.

The three planes above mentioned show the grain from all sides, so to speak, no plane being possible but that would be either one of them or a combination of them. The difficulty, however, of cutting a great number of sections exactly on those planes is obvious, so let it be understood that the terms, "transverse," "radial" and "tangential," are, in many cases, only approximately exact in their application.

My endeavor is to show, either in a part or all of the sections standing, to represent a species, both the heart and sap-wood, but with some woods

as the Sumach, for instance, where usually only the outermost ring, or a part of it, could be said to represent the sap-wood, the display of that is quite impossible. In certain other woods, as the Spruce, etc., the transition from sap to heart-wood is almost indistinguishable by any difference in color, and, although both may be shown in the sections, one can scarcely distinguish between them.

The sequence of the numbers given to the various species is of importance only to show the botanical arrangement within a given Part, each Part being independent of the others.

The text of this work has been added rather as a secondary matter, to supply to those not having it in other form, such information as is of importance, in connection with the wood specimens, to give a fairly good acquaintance with the trees represented. It contains little, if any thing, new to the botanist, but to others it is hoped it may be of some value.

In its preparation some use has been made of my father's Elements of Forestry, and thanks are due the publishers of that work — Messrs. Robert Clarke & Co. of Cincinnati, Ohio — for the use of cuts in reproducing a number of its illustrations. Other valuable books of reference have been the works of Drs. Gray, Wood and Bessey, LeMaout and Decaisne's Descriptive and Analytical Botany, Prof. C. S. Sargent's Report on the Forest Trees of North America (constituting Vol. IX, Tenth Census of the United States, 1880), Micheaux and Nuttall's North American Sylva, George B. Emerson's Trees and Shrubs of Massachusetts, D. J. Browne's Trees of America, etc.

The authenticity of the timbers represented in this work has been a subject of personal attention and special care on the part of the author. The trees selected for specimens have been identified in the field, before felling, while the leaves, flowers or fruit (one or more) have been obtainable, and he can, hence, vouch for the authenticity of every specimen represented.

Succeeding Parts, uniform in style with Part I, and representing in each case twenty-five additional species, are planned to appear later, with the ultimate end in view of representing, as nearly as possible, all of the American woods, or at least the most important, in such a series of volumes as this one.

Upon the reception which this meets in public favor, and upon the co-operation of those interested in the cause, must naturally depend the carrying out of that plan. It is hoped that greater experience and skill will enable us to obviate in future parts the faults which occur, from lack of those qualities, in this.

Notice of errors in this work will be thankfully received in hopes of profiting therefrom in the future.

LOWVILLE, N. Y., *March* 30, 1888.

PREFACE TO PART X.

IN Part X, *AMERICAN WOODS*, we have a continuation of the trees of the Pacific Slope, the fifth installment of the species of this region, and taking up certain trees of special interest. We are particularly pleased to bring out in it sections of the singular Saguaro or Giant Cactus of the arid regions, which always impresses travelers in crossing the arid regions of the southwest. It was with considerable scepticism that a trunk was felled and material taken from it for this use and great was our surprise at finding that we could make and preserve very satisfactory sections. We deem it best, however, to protect them with mica in the mounted frames. We trust our patrons will share with us pleasure in being able to see in these sections the interesting structure of these strange trunks.

We regret some delay in the appearance of Part X, occasioned by demands upon the writer's time for attention to *TREE STUDIES* — the companion work to *AMERICAN WOODS* (taking up illustrations of the trees, their characteristic barks, leaves, flowers, fruit, etc.), as per announcement which was made with Part IX. Much work has been done in connection with that with results which we trust will please those who have expressed a desire for its appearance.

In the preparation of *AMERICAN WOODS* Part X, I wish to gratefully acknowledge assistance and courtesies extended by Prof. Willis L. Jepson, of the University of California, Mr. Chas. H. Shinn, Mr. A. J. Johnson, Mr. A. L. House, Professors R. H. Forbes and A. J. McClatchie of the University of Arizona, Prof. Wm. R. Dudley of Stanford University, and last but by no means least Mr. and Mrs. Theo. Hampe, whose sequestered home is among the Chiricahua Mountains of Arizona and in the vicinity of which several of our wood specimens were gathered.

A General Index to Parts I–X is inserted at the close of this text.

LOWVILLE, N. Y., *Feb.* 29th, 1904.

A KEY BASED UPON THE LEAVES.

Designed as an Aid in identifying the Species represented in Parts I to X
inclusive, when out of Season for procuring the Flowers.

N. B.—As this key applies only to the species thus far represented in AMERICAN WOODS it is important always to confirm identification by applying the more detailed description given in its proper place.

a. Deciduous Leaves.—falling in autumn.

b. Simple Leaves.

c. Laminate—with well marked blade and petiole.

d. Main rib single—pinnately veined.

e. Entire or nearly so, pointed at both ends and

f. Opposite

3-5 in. long, thick, lustrous above..... 9. NYSSA MULTIFLORA.

5-6 in. long, thin, dull above..... 89. CATALPA BIGNONIODES.

f². Alternate, thinnish and in length

g. 6-12 in.

Oblong, petioles $\frac{1}{2}$ in..... 1. MAGNOLIA ACUMINATA.

Lance-obovate; petioles, scarcely 2 in. long..... 76. ASINIMA TRILOBA.

g². 2-7 in.,

h. Thickish, and with light-colored pubescence, at least on the veins beneath.

Petioles about 1 in. long..... 61. DIOSPYROS VIRGINIANA.

Petioles about $\frac{1}{4}$ inch long..... 110. NYSSA OGECHE.

h². Thinnish, oblong-obovate (often remotely serrate).

Convolute in the bud..... 193. SALIX NUTTALLII.

Involute in the bud..... 238. SALIX SITCHENSIS.

g³. 1-3 in., distinctly bluish-green..... 214. QUERCUS DOUGLASII.

f³. Alternate, opposite and scattered upon the same plant, linear.

134. CHILOPSIS SALIGNA.

e². Serrate, serulate or dentate.

f. Inequilateral and cordate or truncate at base,

g. Ovate-orbicular, large, 4-5 in. or more in length.

3. TILIA AMERICANA.

g². Ovate, long-taper-pointed from a broad base.

12. CELTIS OCCIDENTALIS.

g³. Ovate-oblong and

h. Very rough, especially above, rugose 11. ULMUS FULVA.

h². Smoothish and

i. 2-4 in. long, flowers and fruit in

Fascicles..... 33. ULMUS AMERICANA.

Racemes 34. ULMUS RACEMOSA.

i². 1-2 in. long and only slightly inequilateral.

114. PLANERA AQUATICA.

f². Equilateral and obtuse, rounded or cordated at base.

g. Veins straight or nearly so, leaves thinnish.

h. Ovate-oblong.

Coarsely serrate with remote teeth, one at the end of each vein,
ciliate and covered with silky white hairs.

Doubly and sharply serrate, nutlet inclosed
in a papery sac.

41. OSTRYA VIRGINICA.

Unequally and sharply serrate, nutlet subtended by a leafy bract.

42. CARPINUS CAROLINIANA.

- h*². Ovate and
i. Finely and closely serrate, smooth, whitish and reticulate-veined beneath 47. *POPULUS BALSAMIFERA*.
*i*². Doubly serrate and
j. Thinnish; petioles downy and
k. Of aromatic flavor; bark of trunk
 Yellowish-gray; laminate.....17. *BETULA LUTEA*.
 Reddish-brown.....44. *BETULA LENTA*.
*k*². Not of aromatic flavor.....236. *BETULA OCCIDENTALIS*.
*j*². Thickish and bark white.....43. *BETULA PAPYRACEA*.
*g*². Veins incurved; leaves
h. Orbicular-heart-shaped, thickish, 4-8 in. long.
 Acuminate.....63. *MORUS RUBRA*.
 Obtuse or rounded at apex.....97. *POPULUS HETEROPHYLLA*.
*h*². Orbicular-ovate; petioles laterally compressed; leaves
 Coarsely dentate.....18. *POPULUS GRANDIDENTATA*.
 Serrate-dentate.....72. *POPULUS TREMULOIDES*.
*h*³. Broad ovate, acuminate serrate.....218. *POPULUS TRICHOCARPA*.
*h*⁴. Elliptical to obovate, conspicuously netted-veined, above
 Glabrous.....207. *PRUNUS SUBCORDATA*.
 Hairy along veins.....126. *RHAMNUS PURSHIANA*.
*h*⁵. Ovate-lanceolate, pubescent beneath.....209. *PYRUS RIVULARIS*.
*f*³. Equilateral and acute at base, tapering both ways,
g. Narrow-lanceolate, very long-attenuate; petioles
 Bearing dark glands.....237. *SALIX LASIANDRA*.
 Not bearing glands, tomentose on midrib above and petiole.
 45. *SALIX NIGRA*.
*g*². Ovate-lanceolate to lanceolate, long-acuminate, 2-4 in. long; capsules
 Sessile or nearly so.....46. *SALIX ALBA* var. *VITELLINA*.
 With slender peduncles.....71. *SALIX AMYGDALOIDES*.
*g*³. Oblong-lanceolate to lanceolate.
h. Minutely serrulate, 3-7 in. long; petioles downy.
 140. *SALIX LAEVIGATA*.
*h*². Serrate with teeth sharply
 Awn-pointed and in about 20 pairs.....40. *CASTANEA VESCA*.
 Mucronate and in 6-12 pairs.....68. *QUERCUS MUHLENBERGII*.
 Finely glandular-serrate.....55. *PRUNUS PENNSYLVANICA*.
*g*⁴. Oblanceolate to lanceolate-oblong, puberulous beneath.
 165. *SALIX LASIOLEPIS*.
*g*⁵. Obovate-oblong, serrate, hairy beneath; length
 1-3 in., acute.....208. *PRUNUS MOLLIS*.
 3-6 in., long acuminate.....56. *PRUNUS AVIUM*.
*g*⁶. Ovate; petioles
 Short, generally not more than $\frac{1}{2}$ in.....163. *ALNUS RHOMBIFOLIA*.
 Long; leaves very smooth and shining above.....57. *PYRUS COMMUNIS*.
*g*¹. Wedge-obovate, veins very prominent,
 Thin, smoothish and dull above.....58. *CRATAEGUS PUNCTATA*.
 Thick, smooth and lustrous above.....85. *CRATAEGUS CRUS-GALLI*.
*g*⁸. Ovate-oblong, veins incurved and petioles
h. With 2-4 glands, smooth.....29. *PRUNUS SEROTINA*.
*h*². Without glands,
 Glabrous both sides, sharply serrate.
 59. *AMELANCHIER CANADENSIS*.
 Downy under-side and petiole.....30. *PYRUS MALUS*.
*g*⁸. Lanceolate oblong, 1-3 in. long, about equally acuminate at both ends.
 111. *FORESTIERA ACUMINATA*.
*f*⁴. Equilateral and truncate at base,
g. Serrate-dentate with cartilaginous teeth
 Deltoid-ovate, rather long taper-pointed....48. *POPULUS MONILIFERA*.
 Deltoid-reniform, more abruptly pointed....194. *POPULUS FREMONTII*.
 Broadly deltoid.....73. *POPULUS DILATATA*.
*g*². Irregularly serrate or obscurely lobed.....70. *BETULA POPULIFOLIA*.
*e*⁸. Pinnately lobed; lobes at apex
f. Rounded (not bristle-pointed) and

- g.* Subequal, sinuses
Wide, lobes narrow and nearly entire; leaves 5-9 in. long.
38. *QUERCUS ALBA*.
Narrow, lobes wide and
mostly undulate or crenate-toothed; leaves 2-3 in. long.
160. *Q. LOBATA*.
Entire or nearly so and round or obtuse at apex.
136. *Q. GARRYANA*.
- g*². Very unequal,
h. The two lobes nearest the summit much the largest.
92. *QUERCUS OBTUSILOBA*.
*h*². Lyrate-pinnatifid and sinuses extending
Nearly to the midrib and roundish.....39. *QUERCUS MACROCARPA*.
Usually not over half-way to the midrib and more acute.
66. *Q. BICOLOR*.
- f*². Acutish and mucronulate 216. *QUERCUS MACDONALDII*.
*f*³. Bristle-pointed; sinuses
g. Moderately deep and narrow;
Lobes narrowing towards apex and mostly terminating in 1-3 bristle-pointed teeth 15. *Q. RUBRA*.
Lobes generally widening towards apex and terminating in 3-7 bristle-pointed teeth.....162. *Q. CALIFORNICA*.
*g*². Deeper and broader; lobes narrower.....93. *Q. TINCTORIA*.
*g*³. Deep, broad and rounded; lobes very narrow; acorn
Ovoid-oblong, $\frac{1}{2}$ immersed in a coarse-scaled cup.
69. *QUERCUS COCCINEA*.
Flattened-globular, $\frac{1}{4}$ immersed in a fine-scaled cup.
94. *QUERCUS PALUSTRIS*.
- e*⁴. Broad, truncate at both base and apex, and with two spreading lobes on each side.....2. *LIRIODENDRON TULIPIFERA*.
*e*⁵. Wavy and spinous-toothed, very thick.....52. *ILEX OPACA*.
*e*⁶. Undulately crenate-toothed; obovate-oblong,
Slightly if at all pubescent beneath 67. *QUERCUS PRINUS*.
Velvety pubescent beneath... ..116. *QUERCUS MICHAUXII*.
*e*⁷. Sinuate-toothed, white-tomentose beneath.....96. *POPULUS ALBA*.
*e*⁸. Cut-serrate or sublobate, with slender petioles;
Ovate, coarsely cut-serrate.....83. *PYRUS CORONARIA*.
Round-ovate, finely cut-serrate 86. *CRATÆGUS COCCINEA*.
*e*⁹. Crenate-serrate; petioles 1 in. or slightly less in length.
82. *PRUNUS Cerasus*.
*e*¹⁰. Obscurely crenulate-toothed; leaves
f. Alternate, petioles long, mostly $1\frac{1}{2}$ in. or more.
87. *CORNUS ALTERNIFOLIA*.
*f*². Opposite, petioles short (less than 1 in.); involucre scales when fully developed
Obcordate 88. *CORNUS FLORIDA*.
Pointed at apex.....185. *CORNUS NUTTALLII*.
*e*¹¹. Undulate-serrate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long and bearing large scattered glands.
154. *DALEA SPINOSA*.
*e*¹². Doubly serrate,
Rhombic-ovate 81. *PRUNUS NIGRA*.
Ovate-oblong 210. *CRATÆGUS DOUGLASII*.
*e*¹³. Crenately lobed; lobes glandular dentate.....217. *ALNUS OREGONA*.
*d*². Main ribs several, palmately-veined, etc.; rib
e. single at first but soon sending off a strong vein on each side and leaves
3-lobed, 2-lobed and entire on same tree... 32. *SASSAFRAS OFFICINALE*.
*e*². Ribs three at first, but soon five or more by branching, leaves alternate,
base of petiole concave and fitting over the axillary bud, obscurely
3-5-lobed with broad shallow sinuses....13. *PLATANUS OCCIDENTALIS*.
5-lobed with narrow and deeper sinuses....135. *PLATANUS RACEMOSA*.
3-7-lobed with long slender lobes.....232. *PLATANUS WRIGHTII*.
*e*³. 5-7 from commencement; leaves
*e*⁴. 7-9-ribbed and lobed, suborbicular.....203. *ACER CIRCINATUM*.
f. Opposite, base of petiole subtending (not covering) the axillary bud.

- g*. Moderately incised with broad lobes which are
 Sparingly sinuate-toothed 7. ACER SACCHARINUM, WANG.
 Irregularly serrate and notched 53. ACER RUBRUM.
 Sharply and finely doubly serrate.....79. ACER PENNSYLVANICUM.
- g*². Deeply incised with more or less acute sinuses and narrow lobes.
 h. Star-shaped, lobes glandular serrate...60. LIQUIDAMBAR STYRACIFLUA.
 *h*². Palmate
 Lobes incisely toothed.....26. ACER DASYCARPUM.
 Lobes furnished with 2-4 secondary lobes..152. A. MACROPHYLLUM.
- f*². Alternate, tendril bearing vine.....78. VITIS AESTIVALIS.
- e*². Linear, sessile, in delicate 2-ranked sprays.....119. TAXODIUM DISTICHUM.
- e*³. Needle-shaped triangular, short, soft and in fascicles of many each
 $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long; bracts of core included.....23. LARIX AMERICANA.
 1-1 $\frac{3}{4}$ in. long; bracts exserted.....250. LARIX OCCIDENTALIS.
- b*². Compound Leaves.
- c*. Palmate, with usually
 7 obovate leaflets.....6. ÆSCULUS HIPPOCASTANUM.
 5 oblong-lanceolate leaflets..127. ÆSCULUS CALIFORNICA.
- e*². Pinnate with an odd terminal leaflet, rachis
 d. Furnished with prickles.....106. XANTHOXYLUM CLAVA-HERCULIS.
- d*². Not furnished with prickles; leaflets all
 e. Petiolulate, leaflets
 f. 21-41, each with one or two pairs of glandular teeth at its base.
 4. AILANTHUS GLANDULOSUS.
- f*². 11-15,
 With prickles-like stipules, entire.....80. ROBINIA PSEUDACACIA.
 With foliaceous deciduous stipules.....84. PYRUS SAMBUCIFOLIA.
- f*³. 7-9, ovate or lance-oblong, entire or obscurely serrate;
 Petioles and branchlets glabrous.....10. FRAXINUS AMERICANA.
 Petioles and branchlets velvety pubescent..31. FRAXINUS PUBESCENS.
- f*⁴. 3-5; lateral leaflets
 g. Petiolulate and
 h. Irregularly toothed 54. ACER NEGUNDO.
 *h*². Evenly serrate; leaves and young shoots
 Glabrous.....157. SAMBUCUS GLAUCA.
 Pubescent.....229. SAMBUCUS MEXICANA.
- g*². Sessile, subentire 77. PTELEA TRIFOLIATA
- f*⁵. 3-9, generally petiolulate,
 Entire or serrate, acuminate 212. FRAXINUS VELUTINA.
 Coarsely serrate above middle.....231. FRAXINUS DIPETALA.
- e*². Sessile or subsessile
 f. Numerous and pubescent, especially along the petiole and rachis.
 g. Leaflets ovate-lanceolate, finely serrate; pubescence of short, rust-colored
 clammy hairs; leaflets
 7-13, yellow-glandular-dotted.....115. CARYA AQUATICA.
 11-17, fruit subovoid, viscid, pubescent.....14. JUGLANS CINEREA.
 9-23, fruit subglobose, nut obscurely sulcate.
 190. JUGLANS CALIFORNICA.
- g*². Leaflets lance-oblong, coarsely serrate;
 9-23, finely pubescent.....223. JUGLANS RUPESTRIS.
 11-31, velvety pubescent.....5. RHUS TYPHINA.
- f*². 5, quite glabrous; fruit a ridged nut about 1 in. long with thick
 epicarp.....36. CARYA ALBA.
- f*³. 5-7 or 9,
 g. Glabrous, epicarp thin; nut
 Small, thin-shelled 91. CARYA MICROCARPA.
 Larger, moderately thick-shelled.....85. CARYA PORCINA.
- g*². Tomentose; fruit a samara.....187. FRAXINUS OREGONA.
- f*⁴. 7-9, epicarp thick and woody, leaflets
 Puberulent; bark shaggy.....64. CARYA SULCATA.
 Tomentose and odorous 90. CARYA TOMENTOSA.
- f*⁵. 7-11,
 Lanceolate, acute at base, minutely glandular and pubescent
 beneath.....37. CARYA AMARA.

Oblong-lanceolate, glabrous, obtuse or rounded at base; fruit a samara, flat at base ... 62. *FRAXINUS SAMBUCIFOLIA*.

*f*³. 3-5, subentire 77. *PTELEA TRIFOLIATA*.

*b*³. *Decomposed Leaves*.

c. Petioles smooth or pubescent; pinnæ

d. Remaining on during the season; leaves

e. Regularly bipinnate; pinnæ

f. 2, leaflets.

g. 4-6, 2-3 lines long, petiole $\frac{1}{2}$ - $\frac{1}{4}$ in. 128. *CERCIDIUM TORREYANUM*

*g*². 8-12, 1-2 lines long, petiole almost or quite wanting.

204. *PARKINSONIA MICROPHYLLA*.

*g*³. 10-30, petiole

$\frac{1}{3}$ - $\frac{2}{3}$ inches long. 205. *PROSOPIS ODORATA*.

2-4 inches long. 129. *PROSOPSIS JULIFLORA*

*f*². 7, leaflets, sessile 105. *MELIA AZEDARACH*.

*f*³. 8-15, numerous, 1-4 lines long

Rather distant. 206. *ACACIA DECURRENS*.

Crowded 227. *ACACIA MOLLISSIMA*.

*e*². Regularly bipinnate except for the lowest pair of single leaflets; leaflets stalked 27. *GYMNOCLADUS CANADENSIS*.

*e*³. Irregularly bipinnate, leaflets small and sessile,

12-18 in number 109. *GLEDITSCHIA MONOSPERMA*.

18-24 in number 27. *GLEDITSCHIA TRIACANTHOS*.

*d*². Quickly falling away and petioles developing into phyllodia

155. *ACACIA MELANOXYLON*.

*c*². Petioles prickly, leaves large, with ovate, sessile, serrate leaflets.

8. *ARALIA SPINOSA*.

*a*². *Subdeciduous Leaves*—a part only of the leaves falling in autumn, the rest remaining green through the winter.

Obovate-spatulate, entire, shining green both sides.

118. *QUERCUS AQUATICA*.

*a*³. *Persistent Leaves*—evergreen.

b. Simple

c. Needle-shaped and quite stiff, pointing every way,

d. In fascicles (*Pinus*) of

e. Two each, a membranous sheath inclosing the base of each fascicle, about

f. 1 in. long, sheaths very short 99. *P. BANKSIANA*.

*f*². $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long and

Stout; sheaths $\frac{1}{2}$ in. or less; branchlets smooth and purple

98. *P. INOPS*.

Slender $\frac{1}{2}$ in. or more; branchlets rough-scaly 148. *P. CONTORTA*.

*f*³. 2-3 in. long, slender, with short sheaths. 122. *P. CLAUSA*.

*f*⁴. 3-5 in. long,

g. Slender; branchlets

Rough. 75. *P. MITIS*.

Smooth. 123. *P. GLABRA*.

*g*². Thicker; cones in whorls and very oblique. 170. *P. MURICATA*.

*f*⁵. 5-6 in. long, thicker, sheaths elongated. 19. *P. RESINOSA*.

*e*³. Three each and

f. 3-6 in. long; cones

Little if at all oblique $1\frac{1}{2}$ -3 in. long. 50. *P. RIGIDA*.

Very oblique and scales mammillate on outer side.

Ovoid scales furnished with minute prickles. 50. *P. RADIATA*.

Cylindrical ovoid, prickles stouter. 222. *P. ATTENUATA*.

*f*². 5-8 in. long. 121. *P. SEROTINA*.

*f*³. 7-10 in. long, very stout 147. *P. PONDEROSA*.

*f*⁴. 8-15 in. long; cones

g. Subterminal, slightly if at all oblique. 124. *P. PALUSTRIS*.

*g*². Lateral, very oblique and heavy

4-8 in. long; leaves slender, pale blue-green 198. *P. SABINIANA*.

10-14 in. long; leaves stout, dark green 169. *P. COULTERI*.

*e*³. Both two and three each 125. *P. CUBENSIS*.

*e*⁴. Four each (occasionally five) 245. *P. QUADRIFOLIA*.

- e*¹. Five each,
*f*¹. 1-1½ in. long; cones 3½-5 in. long. 246. *P. BALFOURIANA*.
*f*². 1½-3 in. long; cones from
 1½-3 in. long 244. *P. ALBICAULIS*.
 3-10 in long 243. *P. FLEXILIS*.
*f*³. 3-5 in. long
 Very slender; cones 4-6 in. long 49. *P. STROBUS*.
 Thicker; cones 5-11 in. long. 221. *P. MONTICOLA*.
 Stout; cones 10-18 in. long. 146. *P. LAMBERTIANA*.
*f*⁴. 9-13 in. long; cone-scales thickened at apex and furnished with strong
 prickles 197. *P. TORREYANA*.
*d*². Not in fascicles (scattered)
e. Ridged above and below and base
f. Elevated and persistent
g. 4 sided; branchlets
h. Pubescent; leaves
 ¼-¾ in. long, quite stiff. 20. *PICEA NIGRA*.
 1-1½ in. long, quite flexible 247. *PICEA ENGELMANNI*.
*h*². Glabrous 100. *PICEA ALBA*.
*g*². Flat; branchlets smooth; cones cylindrical 149. *PICEA SITCHENSIS*.
*f*². Not elevated nor persistent; leaves short thick and crowded.
 174. *ABIES MAGNIFICA*.
*e*². Ridged below, grooved above, nearly equally 4-sided; bracts of cones
 Included, about half as long as scale 249. *ABIES AMABILIS*.
 Exserted and strongly reflexed. 225. *ABIES NOBILIS*.
*e*³. Terete. 196. *PINUS MONOPHYLLA*.
*c*². Linear, flat and
d. Conspicuously 2-ranked — diverging in two directions,
e. Petioled and margin
f. Obscurely denticulate, obtuse at apex and with persistent bases of
 petioles (*TSUGA*)
 Slightly grooved above, cones pedicilate 21. *T. CANADENSIS*.
 Conspicuously grooved, cones sessile. 223. *T. HETEROPHYLLA*.
*f*². Entire, revolute, acute at apex 144. *TAXUS BREVIFOLIA*.
*e*². Subsessile rigid and sharply bristle-pointed, about
f. 1 inch long, widest at base and with broad shallow grooves beneath
 120. *TORREYA TAXIFOLIA*.
*f*³. 1-3 inches long, more uniform in width.
 White-stomatose beneath.
 248. *ABIES VENUSTA*.
 With deep narrow grooves beneath.
 145. *TORREYA CALIFORNICA*.
*e*³. Sessile, entire, keeled below those of the sterile branches
f. Narrow-linear
 ¾ in. long, obtusely pointed. 22. *ABIES BALSAMEA*.
 ¾ in. long, conspicuously emarginate 224. *ABIES GRANDIS*.
 ¾ in. long, obtuse or acute at apex, rounded above
 173. *ABIES CONCOLOR*.
*f*². Wide-linear, pungent at apex, ½ in. long or less
 143. *SEQUIA SEMPERVIRENS*.
*d*². Somewhat 2-ranked, short-petiolate
e. Articulated on a permanent-base and keeled above
 171. *TSUGA PATTONIANA*.
*e*³. Breaking away entire and leaving permanent leaf-scars
 ¾ to 1 in. long; winter buds ½-¾ in.
 150. *PSEUDOTSUGA TAXIFOLIA*.
 ¾ to 1½ in. long; winter buds ¼-½ in.
 171. *PSEUDOTSUGA MACROCARPA*.
*c*³. Scale-like or awl-shaped, imbricated and closely appressed
d. In 4 ranks and making a conspicuously
e. Flat two-edged branchlet; cones with leathery scales and
 4 scales usually fertile. 24. *THUJA OCCIDENTALIS*.
 6 scales usually fertile. 220. *THUJA GIGANTEA*.
*e*³. Flattish but narrower branchlet. 141. *LIBOCEDRUS DECURRENS*.

- e*³. 4-angled rather than flat branchlet; fruit
f. Subglobose cones with peltate valvate scales and
g. Maturing the first season, small and
h. Conspicuously glandular, cones about
 $\frac{1}{4}$ in. long.....74. CHAMÆCYPARIS THYOIDES.
 $\frac{1}{3}$ in. long.....241. CHAMÆCYPARIS LAWSONIANA.
*h*³. Eglandular; cones nearly $\frac{1}{2}$ in.
240. CHAMÆCYPARIS NOOTKATENSIS.
*g*². Maturing the second season; leaves denticulate
h. Obscurely glandular; and dark green; cones
1-1 $\frac{1}{2}$ in. long.....195. CUPRESSUS MACROCARPA.
 $\frac{1}{2}$ -1 in. long.....166. CUPRESSUS GOVENIANA.
*h*². Conspicuously glandular, glaucous green branchlets
Stout.....239. CUPRESSUS ARIZONICA.
Slender.....219. CUPRESSUS MACNABIANA.
*f*². Fleshy berry-like strobiles; glands of leaves
Inconspicuous; fruit dark blue $\frac{1}{4}$ in. in diameter
25. JUNIPERUS VIRGINIANA.
Very conspicuous; fruit nearly $\frac{1}{2}$ in. in diameter.
242. JUNIPERUS PACHYPHLOEA.
d. Terenate leaves
Roundish at apex.....166. JUNIPERUS CALIFORNICA.
More acute at apex.....168. JUNIPERUS OCCIDENTALIS.
*d*³. Scattered, or spirally arranged, mostly carinate...142. SEQUOIA GIGANTEA.
*c*⁴. Laminate and
d. Elliptical to ovate, about 1 in. long, coriaceous..201. CEANOTHUS SPINOSUS.
*d*². Ovate to oblong
e. Single-ribbed
f. 1-5 in. long, at base
g. Rounded, truncate or slightly heart-shaped,
h. Pale or glaucous beneath, darker above.
i. 1-1 $\frac{1}{2}$ in. long, spinose-dentate 156. PRUNUS ILICIFOLIA.
*i*². 2-3 in. long, entire.....153. RHUS OVATA.
*i*³. 3-5 in. long, entire
Whitish beneath, flat.....132. ARBUTUS MENZIESII.
Greener beneath, curving lengthwise.....180. RHUS LAURINA.
*i*⁴. 2-4 in. long, undulately spinose-toothed 52. ILEX OPACA.
*h*². Tomentose and concave beneath; margin
i. Entire and undulate... ..131. GARRYA ELLIPTICA.
*i*². Both entire and spinose-toothed leaves on the same tree.
j. Lateral veins strongly impressed above, parallel and continuous to
the margins, which are serrate, or occasionally entire.
138. QUERCUS DENSIFLORA.
*j*². Not strongly impressed, and less parallel, pubescent at first beneath
and finally
Glabrous, margin undulate, spinose-toothed
137. QUERCUS AGRIFOLIA.
Glabrous, sinuate spinose-dentate....161. QUERCUS CHRYSOLEPIS.
*g*². Obtuse to acute, stiff, coriaceous, yellow-green beneath.
176. RHAMNUS INSULARIS.
*g*³. Cuneate at base, glabrous or nearly so beneath, slightly revolute, flat.
159. UMBELLULARIA CALIFORNICA.
*f*². 6-12 in. long, thick, entire, acute at both ends.
101. MAGNOLIA GRANDIFLORA.
*f*³. 3-6 in. long, blade
g. Articulated to the petiole, which is
Conspicuously winged; stamens usually 20.
103. CITRUS AURANTIUM.
Slightly, if at all, winged; stamens usually 35.
104. CITRUS LIMONUM.
*g*². Not articulated to petiole which is
Scarcely 1 in. long 158. RHODODENDRON CALIFORNICUM.
-3 in. long.. 188. NICOTIANA GLAUCA.

- e*³. Three-ribbed (*Ceanothus*), in length
 $\frac{1}{2}$ -1 $\frac{1}{2}$ in., ovate, branchlets terete.....202. *C. SOREDIATUS*.
 1-2 in., oblong, branchlets angular.....151. *C. THYRSIFLORUS*.
 2-4 in., broad ovate.....177. *C. ARBOREUS*.
- d*³. Obovate to oblong.
 $\frac{1}{2}$ to 1 $\frac{1}{2}$ in. long, serrate above and entire at base.
 130. *CERCOCARPUS PARVIFOLIUS*.
 1-3 in. long, blue-green.....215. *QUERCUS ENGELMANNI*.
 2 to 5 in. long, with
 Entire revolute margin.....117. *QUERCUS VIRENS*.
 Glandular-serrate margin.....181. *HETEROMELES ARBUTIFOLIA*.
- d*⁴. Ovate-orbicular, thick and obtuse at apex.....179. *RHUS INTEGRIFOLIA*.
- d*⁵. Lanceolate, lateral veins
e. Parallel.....182. *LYONOTHAMNUS FLORIBUNDUS*.
- e*². Not parallel.
*f*¹. Opposite, 2-4 in. long 186. *OLEA EUROPEA*.
*f*². Alternate and beneath
 Glabrous 1 $\frac{1}{2}$ -3 in. long 230. *ARBUTUS ARIZONICA*.
 White-tomentose, 2-4 in. long 235. *QUERCUS HYPOLEUCA*.
- d*⁴. Lanceolate oblong.
 1-2 $\frac{1}{2}$ in. long, entire or repand-serrate 234. *QUERCUS EMORYI*.
- e*³. 3-5 in. long, margin
*f*¹. Crenate-serrate 102. *GORDONIA LASIANTHUS*.
*f*². Crenate-dentate (and entire) tomentose beneath.
 191. *QUERCUS TOMENTELLA*.
*f*³. Sinuate-dentate (and entire) glabrous beneath, dark-green above.
 192. *QUERCUS WISLIZENI*.
- f*⁴. Entire and leaves
g. Opposite, glabrous beneath.....112. *OSMANTHUS AMERICANUS*.
*g*². Alternate and beneath
 Rusty-pubescent.....113. *PERSEA PALUSTRIS*.
 Golden-scurfy beneath 139. *CASTANOPSIS CHRYSOPHYLLA*.
- e*³. 2 in. long, entire, glandular beneath.....108. *CLIFTONIA LIGUSTRINA*.
- d*⁷. Oblanceolate, serrate, with short stout petioles .164. *MYRICA CALIFORNICA*.
- d*⁸. Linear-lanceolate, with broad clasping base and sharp horny tip.
 175. *YUCCA ARBORESCENS*.
- d*⁹. Falcate and vertically disposed upon the branchlet.
 $\frac{1}{4}$ - $\frac{1}{2}$ in. broad.....211. *EUCALYPTUS ROSTRATA*.
 $\frac{3}{4}$ -1 in. broad... ..183. *EUCALYPTUS GLOBULUS*.
- d*¹⁰. Peltate and palmately 7-many-lobed.....189. *RICINUS COMMUNIS*.
- d*¹¹. Flabellate, large and filiferous 200. *WASHINGTONIA FILAMENTOSA*.
- d*¹². Palmately 3-lobed with rufous stellate pubescence
 226. *FREMONTODENDRON CALIFORNICUM*.
- b*². Compound, drooping and with leaflets.
 11-21, irregularly cut-lobed.....213. *GREVILLEA ROBUSTA*.
 25-30, entire or remotely serrate 178. *SCHINUS MOLLE*.
- a*⁴. Leaves Subpersistent — evergreen southward, but more or less deciduous northward
 Narrow obovate; 1-3 in. long 107. *CYRILLA RACEMIFLORA*.
 Lanceolate to oval, 3-6 in. long, glaucous beneath..51. *MAGNOLIA GLAUCA*.
- a*⁵. Leaves wanting: stems green.
 Flat and jointed.. ..184. *OPUNTIA TUNA*.
 Columnar, large and vertically ribbed 228. *CEREUS GIGANTEUS*.

A KEY BASED UPON THE FRUIT

Designed as an Aid in identifying the Species represented in Parts I-X
inclusive, when in Season for procuring the Fruit.

N. B. — The remarks concerning the use of the Key based upon the Leaves are equally true with reference to this.

- a. Free Fruit.** — formed by the ripening of a single pistil either simple or compound.
- b. Indehiscent pericarp.**
- c. Samara** — dry, usually 1-celled, 1-seeded and with 1-2 membranous wings.
 - d.** In terminal panicles; wing somewhat oblong-lanceolate, with a lenticular seed at about its center, and beyond which the wing is twisted (*Ailanthus*) 4. *A. GLANDULOSUS*.
 - d².** In terminal cymes, a 2-seeded suborbicular samara, winged all around.
77. *PTELEA TRIFOLIATA*.
 - d³.** In umbellate corymbs, each pedicel supporting a pair of samaræ with oblanceolate wings, obtuse at the apex and with main rib on outer margin (*Acer*).
 - e.** Fruit maturing in the fall, wings.
 - Slightly divergent 7. *A. SACCHARINUM*, WANG.
 - Widely divergent 203. *A. CIRCUMATUM*.
 - e.²** Fruit maturing in early summer.
 - f.** Large, 1½ in. or more, downy when young..... 26. *A. DASYCARPUM*.
 - f.².** Smaller, smooth, pendulous and
 - Red, in umbels..... 53. *A. RUBRUM*.
 - Greenish, in racemes, wings incurved..... 54. *A. NEGUNDO*.
 - d⁴.** In terminal racemes, two samaræ on a single pedicel with main rib on outer margins; seed-bearing portion
 - Glabrous 79. *ACER PENNSYLVANICUM*.
 - Densely hairy..... 152. *ACER MACROPHYLLUM*.
 - d⁵.** In axillary racemes or panicles, winged at the apex with a more or less lanceolate obtuse wing (*Fraxinus*).
 - e.** Terete at base (seed-bearing portion); branchlets and petioles
 - f.** Smooth. 10. *F. AMERICANA*.
 - f.².** Velvety pubescent; lateral leaflets
 - Petiolulate and
 - 3-7 in number..... 212 *FRAXINUS VELUTINA*.
 - 7-9 in number..... 31. *FRAXINUS PUBESCENS*.
 - Sessile or nearly so..... 187. *F. OREGONA*.
 - e².** Flat — wing extending along the seed-bearing portion.
 - 1-1½ in. long; leaflets sessile 62. *FRAXINUS SAMBUCIFOLIA*.
 - 1 in. long; leaflets petiolulate..... 231. *FRAXINUS DIPETALA*.
 - d⁶.** In lateral fascicles or clusters, winged all around (*Ulmus*).
 - Sessile or nearly so, cell pubescent and margin not ciliate.
11. *U. FULVA*.
 - In fascicles, cell smooth, margin densely ciliate..... 33. *U. AMERICANA*.
 - In racemes, cell pubescent, margin ciliate..... 34. *U. RACEMOSA*.
- c.¹** Drupe or drupe-like and with a single seed.
 - d.** Fibro-fleshy and dryish pericarp
 - e.** Small, ½ in. or less, subglobose (*Rhus*), in terminal
 - f.** Thyrses and clothed with crimson hairs..... 5. *R. TYPHINA*.

- j*². Panicked spikes and clothed with viscid gray hairs,
 2-3 lines in length. 153. *R. OVATA*.
 5 lines in length 179. *R. INTEGRIFOLIA*.
- d*³. Fleshy pericarp,
- e*. Ovoid and
- f*. Clustered on axillary peduncles.
- g*. On the growth of the season, 2 or 3 together, 2½ in. long, blue,
- h*. Sessile upon the peduncle; stone longitudinally striated. 9. *NYSSA MULTIFLORA*.
 113. *PERSEA PALUSTRIS*.
 Enlarged calyx-tube only, 1 in. or less in length.
- h*². Pedicellate, stone not striated; fruit subtended by
 Persistent calyx-tube and lobes, ¼ in. or less in length
 159. *UMBELLULARIA CALIFORNICA*.
- g*³. On growth of the previous season 111. *FORESTIERA ACUMINATA*.
- j*². Racemed, bluish and with short, fleshy, red pedicels. 32. *SASSAFRAS OFFICINALE*.
- e*³. Ovoid-oblong, 1-1½ in. long; petioles
 Biglandular; pit compressed. 81. *PRUNUS NIGRA*.
 Eglandular; pit more turgid 207. *PRUNUS SUBCORDATA*.
- e*³. Oblong, tipped with the remnants of the style and about 1 in. in
 length.
 Reddish and stone longitudinally striated with membranous edged
 ridges 110. *NYSSA OGECHIE*.
 Dark blue, stone not membranous-ridged; flesh
 Thin and dryish 112. *OSMANTHUS AMERICANUS*.
 Thicker and very oily 186. *OLEA EUROPEA*.
 Black and borne in abundance on paniculate spadices.
 200. *WASHINGTONIA FILAMENTOSA*.
- e*⁴. Subglobose and surface
- f*. Smooth
- g*. Purple or purplish black and
- h*. Solitary, of sweet flavor 12. *CELTIS OCCIDENTALIS*.
- h*². In racemes and of a vinous or astringent flavor; racemes
 4-6 in. long; drupes numerous and ¼ in. thick.
 29. *PRUNUS SEROTINA*.
 1-3 in. long; drupes few and larger 156. *PRUNUS ILICIFOLIA*.
- h*³. In umbels, larger, of
 Acid-vinous flavor, ½ in. in diameter 82. *PRUNUS CERASUS*.
 Sweet-vinous flavor, ¾ in. in diameter 56. *PRUNUS AVIUM*.
- g*². Light-red, very sour, in umbels 55. *PRUNUS PENNSYLVANICA*.
- g*³. Dark-red, very bitter, in corymbs 208. *PRUNUS MOLLIS*.
- g*⁴. Whitish
 Not tipped with remnants of the style, rosy-cheeked
 178. *SCHINUS MOLLE*.
 Tipped with the stout styles 180. *RHUS LAURINA*.
- f*². Papillose and with waxy exudation 164. *MYRICA CALIFORNICA*.
- c*³. Drupe-like but containing more than one seed, and seeds
- d*. Inclosed in a bony
- e*. 2-3-celled stone,
- f*. Blue, subglobose, in flat-cymes with red stems.
 87. *CORNUS ALTERNIFOLIA*.
- f*². Bright-red, elongated, sessile, usually in a single head
 Only 3 or 4 developing 88. *CORNUS FLORIDA*.
 30 or 40 developing 185. *CORNUS NUTTALLII*.
- e*². 3-5-celled stone; yellowish-white, in loose axillary panicles.
 105. *MELIA AZEDARACH*.
- d*². Distinct, (not inclosed in a common stone); fruit
- e*. Crowned with persistent
- f*. Calyx-teeth,
- g*. Purple-black, 5-seeded, in umbels 8. *ARALIA SPINOSA*.
- g*². Red or purplish,
 4-8-seeded, axillary 52. *ILEX OPACA*.
 2-seeded, in terminal panicles 181. *HETEROMELES ARBUTIFOLIA*.

- f*². Style or remnants of it ; fruit about
g. $\frac{1}{2}$ in. long, dryish, in racemes 107. *CYRILLA RACEMIFLORA*.
*g*¹. $\frac{1}{4}$ in. long, juicy, in cymes.
 With glaucous bloom 157. *SAMBUCUS GLAUCA*.
 Without bloom 229. *SAMBUCUS MEXICANA*.
- f*³. Not crowned with either calyx-teeth or style,
g. Sessile, scaly-bracted beneath ; leaves evergreen ; fruit
h. Smooth — flower scales obliterated — dark blue ; seeds 1-4.
 25. *JUNIPERUS VIRGINIANA*.
*h*². Nearly smooth — scales nearly obliterated —
 Red-brown, seeds 1-2 167. *JUNIPERUS CALIFORNICA*.
 Dark-blue, seeds 2-3 168. *JUNIPERUS OCCIDENTALIS*.
*h*³. Tuberculate with points of flower scales, red brown ; seeds usually 4.
 242. *JUNIPERUS PACHYPHLOEA*.
- g*². Pedicellate, not scaly-bracted beneath, slightly 2-3-lobed, 2-3-seeded,
 Black ; nutlets indehiscent.....126. *RHAMMUS PURSHIANA*.
 Red ; nutlets dehiscent.....176. *RHAMMUS INSULARIS*.
- c*⁴. Nut and furnished with an involucre cup or covering.
d. Ovoid oblong or ellipsoidal, surrounded at its base with an involucre cup (*Quercus*), acorn borne
e. On the new wood of the season (*i. e.* maturation annual) cup
f. Less than $\frac{1}{2}$ enveloping the oval acorn, which is
 Obtusely pointed ; foliage yellow-green..... 136. *Q. GARRYANA*.
 Acutely pointed ; foliage bluish-green.....214. *Q. DOUGLASII*.
*f*². About $\frac{1}{2}$ enveloping the small
 Ovoid nut $\frac{3}{4}$ in. long ; scales thin.....68. *Q. MUHLENBERGII*.
 Long, narrow nut, often 2 in. long.....160. *Q. LOBATA*.
*f*³. About $\frac{1}{2}$ enveloping the nut
g. Thick, scales very roughly tubercled, edge of cup rather inturned after
 shedding the nut ; foliage
h. Yellow-green, deciduous ; nut long-ovoid ; leaves
 5-9 in. long ; lobes rounded.....38. *Q. ALBA*.
 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ in. long, lobes pointed.....216. *Q. MACDONALDI*.
*h*². Blue-green, persistent ; nut ovid.....215. *Q. ENGELMANNI*.
*g*². Thinner, scales thinnish ; leaves
 Deciduous ; peduncles shorter than petioles....67. *QUERCUS PRINUS*.
 Persistent ; acorns sessile or nearly so, leaves
 Orbicular-oblong.....137. *QUERCUS AGRIFOLIA*.
 Oblong-lanceolate 237. *QUERCUS EMORYI*.
- f*⁴. Scarcely $\frac{1}{2}$ enveloping the oblong-ovoid nut about 1 $\frac{1}{2}$ in. in length.
 116. *QUERCUS MICHAUXII*.
*f*⁵. About $\frac{1}{2}$ or more enveloping the nut ; peduncles longer than the
 petioles ; nut
 $\frac{3}{4}$ in. long, light brown.....66. *QUERCUS BICOLOR*.
 $\frac{1}{2}$ in. or less long, dark brown.....117. *QUERCUS VIRENS*.
*f*⁶. About $\frac{1}{2}$ or more enveloping the nut ; peduncles
g. Longer than the petioles.....66. *Q. BICOLOR*.
*g*². Shorter than the petioles ; scales
 Very loosely appressed, forming a moss-like fringed margin of cup.
 39. *Q. MACROCARPA*.
 More closely appressed and not forming a moss-like fringe.
 92. *Q. OBTUSILOBA*.
- e*². On wood of the preceding season (*i. e.* maturation biennial) ; cup
f. Very shallow, almost flat and with long-linear recurved scales.
 133. *QUERCUS DENSIFLORA*.
- f*². Saucer-shaped,
g. One-fourth enveloping the nut which is
 1 in. or less in length ; saucer thin 15. *Q. RUBRA*.
 1 $\frac{1}{2}$ in. long ; saucer thin at rim.....191. *Q. TOMENTELLA*.
 2 in. or less in length ; saucer usually thick.....161. *Q. CHRYSOLEPIS*.
*g*². One-third enveloping the nut ; leaves persistent and wooly beneath.
 235. *Q. HYPOLEUCA*.
*g*³. One-half enveloping an ovoid nut.....162. *Q. CALIFORNICA*.

- g*⁴. Flattened-globose; leaves
 Sinuate-pinnatifid with wide sinuses..... 94. *QUERCUS PALUSTRIS*.
 Obovate-spatulate, entire..... 118. *QUERCUS AQUATICA*.
- f*³. Top-shaped, $\frac{1}{2}$ enveloping the acorn; scales thin and coarse;
 Inner bark of tree reddish..... 69. *Q. COCCINEA*.
 Inner bark yellowish..... 93. *Q. TINCTORIA*.
- f*¹. Turbinate, $\frac{1}{2}$ enveloping the nut 192. *Q. WISLIZENI*.
- d*². Inclosed in an indelhiscent involucre and with edible kernel (*Juglans*).
- e*. Subglobose and
- f*. Glabrate or pubescent; nut
 Deeply sulcate 233. *J. RUPESTRIS*.
 Obscurely sulcate 190. *J. CALIFORNICA*.
- f*². Roughly dotted, $1\frac{1}{2}$ -2 in. in length and nut deeply sulcate 35. *J. NIGRA*.
- e*². Subovoid, $2-2\frac{1}{2}$ in. long; nut deeply sulcate 14. *J. CINEREA*.
- d*³. Club-shaped, short, surrounded with stiff hairs, tipped with the persistent,
 recurved style and arranged in globular heads, which are
 Solitary or in pairs 13. *PLATANUS OCCIDENTALIS*.
 2-4 together in a moniliform raceme, achenia truncate at apex
 232. *PLATANUS WRIGHTII*.
 2-7 together achenia pointed at apex 135. *PLATANUS RACEMOSA*.
- d*⁴. Achenium-like, small and borne in short catkins,
 Inclosed in a membranous inflated sac, catkin hop-like.
 41. *OSTRYA VIRGINICA*.
 Subtended by a large leafy bract..... 42. *CARPINUS CAROLINIANA*.
- c*⁵. Nut-like, dry, not invested with an involucre,
 Smoothish, globose, about $\frac{1}{4}$ in diameter, in cymes with leaf-like bract
 attached 3. *TILIA AMERICANA*.
 Rough, with scale-like points, ovate, coriaceous.
 114. *PLANERA AQUATICA*.
- c*⁶. Pod (legume) which is
- d*. Oblong, flat, about 2 in. broad and curved... 27. *GYMNOCLADUS CANADENSIS*.
- d*². Linear or nearly so
 10-18 in. long, contorted and twisted... 28. *GLEDITSCHIA TRIACANTHOS*.
 4-6 in. long, subterete, compressed between the seeds and thick-
 valved..... 129. *PROSOPSIS JULIFLORA*.
 3-4 in. long, 2-8-seeded and thin valved... 128. *CERCIDIUM TORREYANUM*.
- d*³. Obliquely ovate (1-2 in. long), long stalked and mostly 1-seeded.
 109. *GLEDITSCHIA MONOSPERMA*.
- d*⁴. Ovate, compressed and with accrescent calyx..... 154. *DALEA SPINOSA*.
- d*⁵. Closely twisted spiral. 205. *PROSOPSIS ODORATA*.
- c*⁷. Pome; endocarp and testa
- d*. Cartilaginous; fruit
- e*. Sunken at insertion of pedicel,
- f*. Globular
 Large, 1 in. or more, distinctly 5-celled 30. *PYRUS MALUS*.
 Small, more or less 10-celled..... 59. *AMELANCHIER CANADENSIS*.
- f*². Fattened-globose, waxy, fragrant and very tart... 83. *PYRUS CORONARIA*.
- f*³. Oblong, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. 209. *PYRUS RIVULARIS*.
- e*². Not sunken at insertion of pedicel, pyriform 57. *PYRUS COMMUNIS*.
- d*². Not cartilaginous, 1-5 bony seeds; color
 Black, subglobose, $\frac{1}{2}$ in. in diameter..... 210. *CRATAEGUS DOUGLASII*.
 Dull red, thickness
 $\frac{3}{4}$ in. (sometimes yellow) with white dots... 58. *CRATAEGUS PUNCTATA*.
 $\frac{1}{2}$ in.; leaves thick, glossy above..... 85. *CRATAEGUS CRUS GALLI*.
 Bright scarlet and somewhat oblong, $\frac{1}{2}$ in. long... 86. *CRATAEGUS COCCINEA*.
- c*⁸. Berry.
- d*. With persistent thickish calyx-lobes, large (about 1 in. or more),
 61. *DIOSPYROS VIRGINIANA*.
- d*³. Without persistent calyx-lobes and smaller
- e*. In thyrses 78. *VITIS AESTIVALIS*.
- e*². In compact-racemes and
 Hoary-tomentose 131. *GARRYA ELLIPTICA*.
 Smooth and flattened-globose..... 133. *ARCTOSTAPHYLOS PUNGENS*.

- e*³. In open panicles, granular-coated
 $\frac{1}{2}$ in. long; leaves oblong 132. ARBUTUS MENZIESII.
 $\frac{1}{4}$ in. long; leaves lanceolate..... 230. ARBUTUS ARIZONICA.
- e*⁴. Singly on the jointed flattened stem. 184. OPUNTIA TUNA.
- e*⁹. Fleshy, with custard-like edible pulp 76. ASIMINA TRILOBA.
- c*¹⁰. Berry-like pome, $\frac{3}{8}$ in. in diameter and borne in dense clusters.
 84. PYRUS SAMBUCIFOLIA.
- c*¹¹. Hesperidium — seeds in juicy pulp and rind leathery.
 Subglobose, flattened at the ends 103. CITRUS AURANTIUM.
 Globose-oblong, mammillate at the extremity..... 104. CITRUS LIMONUM.
- c*¹². Achenium.
 3-4-angled and with membranous wing-like margins.
 103. CLIFTONIA LIGUSTRINA.
 Linear oblong, tipped with the prolonged tail-like style.
 130. CERCOCARPUS PARVIFOLIUS.
- c*¹³. Baccate but with dry spongy pericarp..... 175. YUCCA ARBORESCENS.
- b*². Dehiscent pericarp,
c. Subglobose, and
d. Coriaceous or woody, dehiscent by
e. 2-3 valves and containing one or very few large seeds with smooth shining
 coat and a large scar (*Æsculus*), fruit
 Prickly and leaflets 7 6. ÆSCULUS HIPPOCASTANUM.
 Smooth and leaflets 5 127. ÆSCULUS CALIFORNICA.
- e*². 4 more or less distinct valves (*Carya*).
f. Epicarp thick and separating quite freely to the base; nut ridged, with
 thick shell, globular-ovoid and
g. Flattened,
 1 in. or less in length..... 36. CARYA ALBA.
 1½ in. or more in length..... 61. CARYA SULCATA.
*g*². Not so much flattened, usually 4-angled .. . 90. CARYA TOMENTOSA.
- f*². Epicarp only moderately thick and nut of medium size, moderately
 ridged and with shell of medium thickness..... 65. CARYA PORCINA.
- f*³. Epicarp thin, nuts small and thin-shelled; kernel
g. Astringent and bitter; sutures of epicarp very prominent; nut
 Quite smooth, whitish and only slightly compressed.
 37. CARYA AMARA.
 Rough, reddish, strongly compressed and angled.
 115. CARYA AQUATICA.
- g*². Slightly if at all bitter, nut whitish and sutures moderately prominent.
 91. CARYA MICROCARPA.
- e*³. 5-20 valves recurving from central axis and liberating numerous fine
 seeds 158. RHODODENDRON CALIFORNICUM.
- d*². Covered with spines; dehiscent
c. By four valves; nuts
 Sharply 3-angled, 2 together, involucre soft-prickly.
 16. FAGUS FERRUGINEA.
 Subovoid, flattened, 1-3 together, involucre spines very sharp and
 hard.. 40. CASTANEA VESCA.
- e*². Irregularly; spines many-branched; nut maturing the second year.
 139. CASTANOPSIS CHRYSOPHYLLA.
- e*³. Into three cocci, each liberating a single seed ... 189. RICINUS COMMUNIS.
- c*². Small, ovoid-lanceolate capsules arranged in catkins, opening by two valves
 and containing numerous seeds furnished with silky down; capsule
d. Oblong-conical, small and thin-walled; leaves
e. Orbicular-ovate and
f. Coarsely dentate..... 18. POPULUS GRANDIDENTATA.
*f*². Serrate, short-pointed 72. POPULUS TRENULOIDES.
 Sinuate, wooly tomentose beneath 96. POPULUS ALBA.
 Linear lanceolate, tomentose on midrib above and petiole.
 45. SALIX NIGRA.
- e*². Ovoid-oblong, larger and thicker walled; leaves
f. Broad-ovate, obscurely crenate-serrate obtuse or rounded at apex.
 97. POPULUS HETEROPHYLLA.
- f*². Ovate or ovate-lanceolate, acuminate, whitish and reticulate-veined
 beneath 47. P. BALSAMIFERA.

- f*³. Deltoid-ovate coarsely crenate-serrate usually.
Abruptly acuminate..... 48. *POPULUS MONILIFERA*.
Shorter-pointed or acute 194. *POPULUS FREMONTII*.
- f*⁴. Broadly deltoid..... 63. *POPULUS DILATATA*.
- d*². Larger, subglobose and pubescent..... 218. *POPULUS TRICHOCARPA*.
- d*⁶. Lanceolate or elliptic-lanceolate,
e. Smooth and capsules
f. Sessile or nearly so..... 46. *SALIX ALBA* var. *VITELLINA*.
*f*². With slender pedicels; leaves pale.
g. Glaucons beneath and petioles.
h. Glandular 237. *SALIX LASIANDRA*.
*h*³. Not glandular and leaves.
2-4 in. long finely serrate..... 71. *SALIX AMYGDALOIDES*.
3-7 in. long obscurely serrate. 140. *SALIX LAEVIGATA*.
*g*². Pubescent beneath, entire or remotely serrate.. 165. *SALIX LASIOLEPSIS*.
- c*². Pubescent; capsules about.
 $\frac{1}{8}$ in. long, ovate-lanceolate..... 193. *SALIX NUTTALLII*.
 $\frac{1}{4}$ in. long.
Oblong-ovoid glabrous 165. *SALIX LASIOLEPSIS*.
Ovoid, pubescent 238. *SALIX SITCHENSIS*.
- c*³. Linear compressed pods opening by two valves; pods
4-5 in. long, $\frac{1}{2}$ in. broad, quite straight..... 80. *ROBINIA PSEUDACACIA*.
3-5 in. long, variously twisted; leaflets
Rather distant..... 206. *ACACIA DECURRENS*.
Crowded 227. *ACACIA MOLLISSIMA*.
2 in. long, $\frac{1}{4}$ in. broad, often curved into a circle.
155. *ACACIA MELANOXYLON*.
- c*⁴. Torulose, straight or curved, pods 2-3 in. long, 1-3-seeded.
204. *PARKINSONIA MICROPHYLLA*.
- c*⁵. Subcylindrical pods, long, opening by two valves.
6-10 in. long, $\frac{1}{4}$ in. or less thick..... 134. *CHILOPSIS SALIGNA*.
10-12 in. or more long, $\frac{1}{4}$ in. or more thick... 89. *CATALPA BIGNONIODES*.
- c*⁶. Very oblique and containing two winged seeds... 213. *GREVILLEA ROBUSTA*.
- c*⁷. Ovoid 5-valved capsule.
Glabrous..... 102. *GORDONIA LASIANTHUS*.
Covered with stinging hairs..... 226. *FREMONTODENDRON CALIFORNICUM*.
- c*⁸. Subovoid follicles arranged
In pairs, seed not suspended by a funiculus.
182. *LYONOTHAMNUS FLORIBUNDUS*.
Not in pairs; seed suspended by a funiculus.
106. *XANTHOXYLUM CLAVA-HERCULIS*.
- c*⁹. Three-lobed capsules dividing into three dehiscent cocci; (*Ceanothus*)
leaves
d. 3-ribbed and length
 $\frac{3}{4}$ -1 $\frac{1}{2}$ in., ovate; branchlets terete 202. *C. SOREDIATUS*.
1-2 in., oblong; branchlets angular..... 151. *C. THYRSIFLORUS*.
- d*³. Single-ribbed,
1 in. long, branchlets terete coriaceous. 201. *C. SPINOSUS*.
2-4 in. long, branchlets slightly angled... .. 177. *C. ARBOREUS*.
- c*¹⁰. Top-shaped capsule, $\frac{3}{4}$ in. in diam., cells dehiscent at summits.
183. *EUCALYPTUS GLOBULUS*.
- c*¹¹. Hemispheric capsule, $\frac{1}{4}$ in. in diam. cells dehiscent at summits.
211. *EUCALYPTUS ROSTRATA*.
- c*¹². Oblong-ovoid 2-valved capsule closely invested by persistent calyx.
188. *NICOTIANA GLAUCA*.
- c*¹³. Baccate, dehiscent by 3 or 4 fleshy valves. 228. *CEREUS GIGANTEUS*.
- a*². Aggregated Fruit — composed of many carpels, either closed or opened and
cohering or closely massed together, forming a
b. Cone.
c. Scales of the cone open carpels (*Coniferae*).
d. Scales many and spreading at maturity.
e. Imbricated and each subtended by a bract; ovules 2, inverted, and
f. Maturing the year after flowering (*Pinus*); cones
g. Subterminal and scales

- h.* Thin at tip and unarmed; cones subcylindric and
 4-6 in. long.....49. *P. STROBUS.*
 5-11 in. long.....221 *P. MONTICOLA.*
 12-18 in. long.....146. *P. LAMBERTIANA.*
- h*². Thickened at tip and
i. Armed with a recurved prickle.
j. 1-3 in. long, cylindric ovoid, oblique.....148. *P. CONTORTA.*
*j*². 3-6 in. long, glossy-brown,
k. Elongated conical, separating from the tree by a fracture
 Within the peduncle.....125. *P. CUBENSIS.*
 Within the base of cone.....147. *P. PONDEROSA.*
*k*². Broad-ovoid.....197. *P. TORREYANA.*
*k*³. Subcylindrical, 3½-5 in. long, with very weak prickle.
 246. *P. BALFOURIANA.*
- j*³. 6-10. in. long.....124. *P. PALUSTRIS.*
- i*². Unarmed, cones about 2 in. in length, seeds
j. Winged, about ¼ in. long.....19. *P. RESINOSA.*
*j*². Wingless; leaves.
k. In fives; cones.
 1½-3 in. long.....244. *P. ALBICAULIS.*
 3-10 in. long.....243. *P. FLEXILIS.*
*k*². In fours 245. *P. QUADRIFOLIA.*
*k*³. Single.....196. *P. MONOPHYLLA.*
- g*². Lateral and scales thickened at tip, cones
h. Slightly or not at all oblique
i. Ovoid-oblong; leaves 3-5 in. long; scales armed with a weak prickle
 directed
 At about right angles from the axis of the closed cone.
 75. *P. MITIS.*
 Forward, at about 45° or less from the axis....123. *P. GLABRA.*
- i*². Ovoid-pyramidal.
j. Prickles strong; cones 2 in. or
 Rather less in length; leaves 1½-3 in. long; branchlets purple.
 89 *P. INOPS.*
 Rather more; leaves 3-5 in. long.....50. *P. RIGIDA.*
- j*². Prickles weak; cones 2-3 in. long, and
 Wide-pyramidal; leaves in 3's.....121. *P. SEROTINA.*
 Narrow-pyramidal; leaves in 2's.....122. *P. CLAUSA.*
- h*². Markedly oblique
 2-in. or less in length, scales unarmed.....99. *P. BANKSIANA.*
 2-3½ in. long, scales armed with strong prickles..170. *P. MURICATA.*
 3-5 in. long, outer scales very gibbous; oblique.
 Ovoid, prickles minute and weak.....190. *P. RADIATA.*
 Cylindrical ovoid, prickles stouter.....222 *P. ATTENUATA*
 4-8 in. long; scales very strongly armed. 198. *P. SABINIANA.*
 10-15 in. long, armed with very large, strong prickles.
 169. *P. COULTERI.*
- f*². Maturing the first season — the autumn after blossoming.
g. Ovoid or oblong, ½ in. long, pendent; bracts inconspicuous; scales per-
 sistent on the axis, thin and with eroded tip.....20. *PICEA NIGRA.*
- g*². Ovoid, pendent; scales thin and entire at tip.
 Pedunculate, 5⁄8-¾ in. long; cone scales orbicular oblong bracts
 truncate.....21. *TSUGA CANADENSIS.*
 Sessile, ¾-1 in. long; cone-scales oblong; bracts cuspidate.
 223 *TSUGA HETEROPHYLLA.*
- g*². Ovoid, small (8 lines or less), pendent, scales rounded and entire at tip.
 21. *TSUGA CANADENSIS.*
- g*². Subcylindrical
h. Erect; scales deciduous from the persistent axis (*Abies*); bracts
i. Shorter than cone-scales; leaves with resin ducts
j. Within the parenchyma
 Cones 2½-4 in. long, purple 22. *A. BALSAMEA.*
*j*². Close to epidermis of lower side; cones

- k.** 2-5 in. long; leaves
Dark-green above, flat, flexible and conspicuously emarginate. 224. *A. GRANDIS*.
Blue-green above, flat, rounded or acuminate at apex. 173. *A. CONCOLOR*.
- k².** 3½-6 in. long 249. *ABIES AMABILIS*.
- k³.** 6-9 in. long; leaves blue-green, 4-sided 174. *ABIES MAGNIFICA*.
- i².** Longer than the cone scales.
Spatulate, reflexed and nearly covering the scales; cones 6-8 in. long 225. *ABIES NOBILIS*.
Obcordate with long exserted awl-shaped central lobe; cones 3-4 in. long 248. *ABIES VENUSTA*.
- h².** Nodding, small (about 2 in. long), scales persisting on the axis and entire at tip. 100. *PICEA ALBA*.
- h³.** Pendent; scales incisely denticulate.
2½-4 in. long; leaves flattened 149. *PICEA SITCHENSIS*.
1-3 in. long; leaves tetragonal 247. *PICEA ENGELMANNI*.
- g⁴.** Cylindrical oblong; bracts much exserted (*Pseudotsuga*); cones
2-3 in. long 150. *P. TAXIFOLIA*.
5-8 in. long 172. *P. MACROCARPA*.
- g⁵.** Ovoid or roundish, small, 9 lines or less in length, scales persistent on the axis at maturity 23. *LARIX AMERICANA*.
- g⁶.** Oblong, 1-1½ in. long; scales numerous and shorter than bracts. 250. *LARIX OCCIDENTALIS*.
- e².** Valvate, bractless, wedge-shaped, spreading, each with 3-7 inverted ovules; cone woody, oval and
2-3 in. long, scales usually 25-30 142. *SEQUOIA GIGANTEA*.
1 in. or less, scales short, 20 143. *SEQUOIA SEMPERVIRENS*.
- d².** Scales few, persistent, bractless; cone
- e.** Oblong and erect, with scales more or less thickened at tip,
- f.** Loosely imbricated, 8-12, thinnish.
Four scales only fertile 24. *THUJA OCCIDENTALIS*.
Six fertile. 220. *THUJA GIGANTEA*.
- f.** Valvate, 4-6, thick, only two scales fertile. 141. *LIBOCEDRUS DECURRENS*.
- e².** Globose or subglobose, maturing the
- f.** First season, and in diameter about
¼ in. 74. *CHAMÆCYPARIS THYOIDES*.
½ in. 241. *CHAMÆCYPARIS LAMSONIANA*.
¾ in. 240. *CHAMÆCYPARIS NOOTKATENSIS*.
- f².** Second season and
- g.** ½-¾ in. in length; leaves conspicuously glandular; branchlets
Stout 239. *CUPRESSUS ARIZONICA*.
Slender 219. *CUPRESSUS MACNABIANA*.
- g².** ¾-1 in.; leaves obscurely glandular 166. *CUPRESSUS GOVENIANA*.
- g³.** 1-1½ in. leaves obscurely glandular 195. *CUPRESSUS MACROCARPA*.
- d³.** Scales several, breaking apart at maturity; cones subglobose. 119. *TAXODIUM DISTICHUM*.
- c².** Scales.
- d.** Thin, 3-lobed and deciduous, subtending very small samaræ (*Betula*).
- e.** Cones erect,
Sessile, ovoid-oblong, 1 in. in length 17. *B. LUTEA*.
With downy peduncle, ovoid, smaller 95. *B. NIGRA*.
- e².** Cones suberect, ovoid-oblong; scales thicker and with short divergent lobes; wing of nutlet not broader than the body 44. *B. LENTA*.
- e³.** Cones pendent, cylindrical and about
1 in. in length. 70. *B. POPULIFOLIA*.
1½ in. in length; scales
Glabrous 43. *BETULA PAPYRACEA*.
Puberulous, with ciliate margin 236. *BETULA OCCIDENTALIS*.
- d².** Thick, woody and persistent, ovoid-oblong
1½-2 in. long; leaves pale-puberulous beneath. 163. *ALNUS RHOMBIFOLIA*.
¾-1 in. long; leaves rusty pubescent beneath. 217. *ALNUS OREGONA*.
- c³.** Scales closed carpels, growing from an elongated receptacle and consolidated.

- d.** Dehiscent at maturity along the medium line of the back and letting out each 1-2 berry-like seeds suspended by extensile threads (*Magnolia*);
cone

Cylindrical, curved, 2-3 in. long.....1. *MAGNOLIA ACUMINATA*.

Oblong, 1-1½ in. long.....51. *MAGNOLIA GLAUCA*.

Oval, 3-4 in. long.....101. *MAGNOLIA GRANDIFLORA*.

- d².** Indehiscent at maturity and falling away as samaræ.

2. *LIRIODENDRON TULIPIFERA*.

- b².** Spherical head, hardened and bristling with 2-beaked capsules.

60. *LIQUIDAMBAR STYRACIFLUA*.

- b³.** Sorosis—a spike with bracts and calyx-lobes all thickened and succulent.

63. *MORUS RUBRA*.

- a³. A Naked Seed**, subtended or surrounded by a fleshy disk.

- b.** Drupe-like, with fleshy covering, sessile, scaly-bracted beneath and about

1 in. in length, oval.....120. *TORREYA TAXIFOLIA*.

1½ in. length, obovoid .. 145. *TORREYA CALIFORNICA*.

- b³.** Bony seed, subtended by a fleshy cup.....144. *TAXUS BREVIFOLIA*.

A SYSTEMATIC STUDY

OF THE

SPECIES WHOSE WOODS ARE REPRESENTED IN THE ACCOMPANYING SECTIONS.

The timbers comprised in the series which this text is designed to accompany belong to what are known, botanically speaking, as *Flowering* and mostly *Exogenous Plants*. At the outset, therefore, we will, once for all, define these groups; and, as the characters herein given are equally true of all the species enumerated in the following pages, they need not be repeated in the further definition of the various sub-groups and species.

FLOWERING OR PHÆNOGAMOUS PLANTS.

Plants producing flowers which consist essentially of stamens and pistils, the latter bearing ovules or seeds.

In distinction from the *Flowering Plants* are the *Flowerless* or *Cryptogamous Plants*, comprising the rest of the vegetable kingdom, from the very simply organized Slime Moulds and Bacteria up to the highly organized Ferns and Club-Mosses. But in the study of timbers this group is unimportant, as only in a few rare cases do any of its representatives attain the dimensions of trees. Those exceptions are the Tree-Ferns of tropical countries—gigantic ferns, which sometimes attain the height of fifty or sixty feet, with straight shafts quite like tree trunks and tops consisting of a bunch of enormous plume-like fronds. They, however, are of practically no value as timber.

EXOGENOUS OR DICOTYLEDONOUS PLANTS.

Flowering plants whose stems consist of a central column of pith surrounded by wood in concentric layers, and this in turn by bark; the stems increasing in thickness by the addition of a new layer each year to the wood externally and to the bark internally. Leaves mostly netted-vein. First leaves of the embryo (cotyledons) two and opposite, or (in the Coniferæ) several in a whorl. Parts of the flower in fours or fives, very rarely in threes.

A second class of *Flowering Plants* and comprising the rest of the group is the *Endogenous* or *Monocotyledonous Plants*, characterized by having stems in which the wood occurs as threads or bundles running through a cellular, pith-like tissue so that a transverse section exhibits the wood as dots and not in concentric rings. Leaves mostly parallel-veined. Embryo with single cotyledon, or rarely two, and then alternate and unequal. Parts of the flower generally in threes. In southern United States and elsewhere in or near the tropics trees are found, such as the Palms, etc., which belong to this class.

Exogenous plants are subdivided into two well-marked groups or sub-classes — *Angiospermæ* and *Gymnospermæ*. The former includes by far the greater part of the *Flowering Plants*, and most of the species represented in “*American Woods*” are representatives of it.

ANGIOSPERMÆ.

Flowering, exogenous plants in which there is a complete pistil — with stigma and closed ovary — containing ovules which develop into seeds at maturity. This sub-class comprises many groups of plants known as *Orders*, and such as are represented by plants which attain the dimensions of trees, within the limits of the United States, we propose to consider in the following pages:

ORDER CHEIRANTHODENDRÆ.

Leaves alternate, lobed, stellate-pubescent and with caducous stipules. *Flowers* perfect, 5-numerous; calyx subcampanulate, deeply lobed, imbricated in æstivation, colored and persistent; petals none; stamens alternate with the sepals, inserted on the receptacle and united into a column; ovary superior with numerous horizontal axial ovules. *Fruit* a hispid 5-valved, loculicidally dehiscent capsule with rather large seeds having fleshy albumen and straight embryo.

A small family consisting of the Mexican Hand-tree, *Cheiranthodendron platanoides*, Baill and the following:

GENUS FREMONTODENDRON, COVILLE.

Leaves alternate, palmately-lobed, thick, with prominent veins and rufous stellate pubescence; stipules minute, caducous. *Flowers* pedunculate and each subtended by 3 or 5 minute caducous bracts; calyx deeply 5-cleft with yellow spreading roundish lobes, about 1 in. long, pubescent outside and hairy at base within; stamens regular, united below to about the middle, the slender filaments then separating alternately with the sepals and each bearing an adnate oblong-linear curved extrorse 2-celled anther, longitudinally dehiscent; pistil with elongated filiform style, acute stigma and 5-celled ovary, each cell containing numerous horizontal anatropous ovules. *Fruit* an ovoid, firm coriaceous acuminate capsule about 1 in. long, densely covered with short stinging hairs, cells villous within and containing oval seeds about $\frac{1}{4}$ in. long; cotyledons foliaceous.

A genus of a single species and named after the distinguished explorer, Gen. John Chas. Fremont, who discovered the species, and the Greek δένδρον, tree.

226. FREMONTODENDRON CALIFORNICUM (TORR.)

FREMONTIA. CALIFORNIA SLIPPERY ELM.

Ger., *Fremontia*; Fr., *Fremontia*; Sp., *Fremontia*.

SPECIFIC CHARACTERS:—*Leaves* usually moderately 3-lobed, but sometimes 5 or 7-lobe, about $1\frac{1}{2}$ in. long and with stout petioles about $\frac{1}{2}$ in. long; branchlets stout, light reddish brown, terete and densely rufous-pubescent at first. *Flowers* appear in July in abundance from spur-like lateral branchlets. *Fruit* as described for the genus.

A small tree rarely 30 ft. (9m.) in height with wide intricate top of stout rigid branches and trunk sometimes 12 in. (0.30m.) in thickness, covered with very dark brown bark, fissured irregularly into firm ridges and plates which exfoliate in thick scales and fragments. It is more often an intricately branching shrub than a tree. Its profusion of brilliant yellow flowers give it a very characteristic and striking appearance in mid-summer when it may be seen miles away.

HABITAT.—The *Fremontia* is found on dry gravelly soil along the foot hills of the mountains of California, from the western slope of Mt. Shasta and Lake Co., to the southern boundary of the state, attaining its largest size on the western slopes of the Sierra Nevada mountains, where, however, it is not very abundant. On the eastern slopes and southward it is more shrubby in habit of growth and abundant in places, forming every extensive thickets.

PHYSICAL PROPERTIES.—The wood of this species is hard, heavy, strong, of close grain and with rather conspicuous medullary rays. The sap-wood is of a creamy white color, the heart-wood of a light reddish brown and finally chocolate brown. *Specific Gravity*, 0.7142; *Percentage of Ash*, 1.69; *Relative Approximate Fuel Value*, 0.7021; *Weight of a Cubic Foot in Pounds*, 44.50.

MEDICINAL PROPERTIES.—The inner bark of the species is very mucilaginous and used in domestic practice for poultices, as is that of the Slippery Elm (*U. fulva*) of the eastern states and from this fact the name *Slippery Elm* came to be applied to it.

ORDER LEGUMINOSÆ: PULSE FAMILY.

Leaves alternate, usually compound, entire and furnished with stipules. *Flowers* with 5 sepals more or less united at the base; petals 5, papilionaceous or regular; stamens diadelphous, monadelphous or distinct and with versatile anthers; pistils single, simple and free. *Fruit* a legume (pod) with mostly albumenless seeds.

One of the largest and most widely distributed families of the vegetable kingdom, represented in all lands and of great economic importance.

GENUS ACACIA, NECKER.

Leaves variable, in the native American species bipinnate with usually small leaflets in many pairs, but in many of the exotic species the leaflets fall away and the petioles expand, becoming phyllodia; stipules spinescent or inconspicuous. *Flowers* perfect or polygamous, small, generally yellowish or greenish-white in pedunculate globose or cylindrical spikes, each flower in the axil of a minute linear or spatulate bractlet; calyx campanulate, 4-5-toothed or sometimes divided into distinct sepals, or reduced to hairs, valvate in æstivation; petals of the same number as the lobes of the calyx, generally more or less united below or rarely wanting; stamens numerous and indefinite, usually more than fifty, exserted, free or slightly united at base, inserted beneath the ovary, filaments filiform, anthers small, 2-celled, versatile, introrse, longitudinally dehiscent; ovary sessile or stipitate, two or many-ovuled, contracted into a long slender style with minute terminal stigma; ovules anatropous, suspended in two ranks from the inner angle of the ovary. *Fruit* a legume, dehiscent by two valves or indehiscent.

continuous within or variously divided, very rarely separating into one-seeded joints, the seeds usually ovate, compressed, without albumen and with thick crustaceous testa.

Genus composed of over 400 species of trees, shrubs and a few herbs of warmer climates, and especially of Australia. About a dozen species are found native in southwestern United States. The name is thought to be derived from the Greek ἀκάζω, to *sharpen*, alluding to the spines with which many of the species are armed.

227. ACACIA MOLLISSIMA, WILLD.

SILVER WATTLE. BLACK WATTLE.

Ger., *Silberige Acacie*; Fr., *Acacia d'argent*; Sp., *Acacia plateada*.

SPECIFIC CHARACTERS:—*Leaves* bipinnate, of 8-15 pairs of pinnae with numerous narrow crowded leaflets 2-3 lines long; branchlets with angles decurrent from the petioles only slightly prominent, pubescent, and the young shoots of a yellowish tint. *Flowers* (December-March) fragrant, in terminal axillary paniced globular heads. *Fruit* pods flat, mostly less than 4 lines thick, more or less constricted between the seeds.

The specific name, *mollissima*, is the Latin for "most delicate," aptly descriptive of the foliage of the tree.

A beautiful small or medium size tree with round top and graceful, delicate feathery foliage. The trunk is sometimes 18 in. (0.45 m.) in diameter, with quite smooth grayish brown bark about 1 in. in thickness.

HABITAT. — The native home of the Silver Wattle is in Tasmania and Victoria; less commonly the northern districts of New South Wales. It has become naturalized in at least the central coast region of California and thrives in almost all kinds of soils.

PHYSICAL PROPERTIES. — Wood rather heavy and hard, strong, with quite uniformly distributed ducts, with fine medullary rays, of flexuous grain and indistinct annual rings. It is of a rather pale reddish brown color with lighter narrow sap-wood.

USES. — The points of utility of this tree are practically the same as those of the closely related *Acacia decurrens*. The wood makes an excellent fuel, and is adapted to use in cooperage, for tool handles, etc. The bark is rich in tannin, and the delightfully fragrant flowers find ready sale in the city markets. For ornamental purposes in door yards and parks the tree has few equals, and for reclaiming waste lands in the arid regions it is of marked value.

MEDICINAL PROPERTIES are found in the tannin, which the bark yields in considerable abundance, and in a gum arabic of rather inferior quality which the tree produces.

ORDER CACTACEÆ: CACTUS FAMILY.

Leaves generally wanting, sometimes minute and deciduous (rarely perfect, flat, and petiolate); stems green, fleshy, covered with tubercles, cylindrical, flat, or variously angled, channelled or winged, elongated, simple or branched or globose, with thick usually green bark and loose cellular tissue, without stipules,

usually furnished with remarkable spines springing in fascicles from areolæ in the axils of leaves or absent leaves. *Flowers* perfect, usually solitary, often large and showy, ephemeral; sepals numerous, the inner petal-like, united below for considerable length into a tube adnate to the ovary; petals delicate, in two or more rows united below with the sepals; stamens numerous in several rows, with long filiform filaments and introrse two-celled longitudinally dehiscent anthers; ovary inferior, one-celled with parietal placentæ and numerous anatropous ovules; style simple, elongated and stigmas as many as the placentæ. *Fruit* a pulpy umbilicate berry, smooth or furnished with spines and containing numerous seeds, with or without albumen, buried in the pulp.

A large order of few genera, but many species, of plants of very peculiar aspect, confined quite exclusively to the American continent, natives of dry arid regions and most abundant in or near the tropics.

GENUS *CEREUS*, HAWORTH.

Leaves absent. *Flowers* perfect, as long as wide or longer, large and showy, sometimes nocturnal and very fragrant; calyx usually elongate with numerous spirally imbricated lobes and a nectiferous tube; petals numerous, cohering with the top of the calyx tube, spreading, recurved, white or red, imbricated in aestivation; stamens very numerous and inserted in the calyx tube with filiform filaments and minute oblong introrse 2-celled anthers; ovary inferior, 1-celled, with elongate filiform style divided into numerous radiating stigmatic branches and containing many horizontal ovules arranged on parietal placentæ. *Fruit* baccate, covered with scales or spines, often edible, many seeded.

Genus consists of trees or shrubs of about 200 species, with watery juice, and ribbed, columnar erect stem, or low, spreading or climbing and 3-7-angled or cylindrical or globose stem, spine-bearing from areolæ on vertical ribs. The name *Cereus* is the Latin for *candle* in allusion to the erect candle-shaped form of some of the individuals.

228. *CEREUS GIGANTEUS*, ENGELM.

SAGUARO. SUWARRO. GIANT CACTUS.

Ger., *Riesencactus*; Fr., *Cactus gigantesque*; Sp., *Saguaro*.

SPECIFIC CHARACTERS:—*Flowers* (May to July) in ample clusters at or near the top of the plant, not from any preformed areolæ but bursting through the epidermis just above the bunches of spines, 4-4½ in. long and about half as broad when fully expanded; calyx tube stout and covered with thick imbricated green scales, those lowest down (over the ovary) with free acute mucronate tips and clusters of short hairs on spines in their axils. Farther up the scale tips lengthen, become thinner, obovate in outline and closely imbricated; petals numerous, creamy white, thick, about ⅔ in. long, rounded or obtuse and entire at apex, much reflexed after expansion; stamens very numerous, with long slender filaments; style stout, columnar, with nectiferous glands at its base and dividing at its summit into 12 or 15 green stigmas. *Fruit* ripe in August, is oblong, light red, truncated and depressed at apex, about 2½ in. long, covered with persistent scales and finally bursting into three or four valves, revealing a juicy mass of innumerable dark brown seeds about ¼ in. long. After the seed-bearing contents dries and falls away, the dry star-shaped pericarp remains for a time longer on the plant.

These strange columnar trees, seeming at first glance more like dead stubs than trees, are sometimes 50 or 60 ft. (18 m.) in height, and 2 ft. (0.60 m.) in diameter, somewhat below the middle, and tapering gradually both ways. They are branchless or furnished with one or very few large branches which grow out and then upwards generally parallel with the main stem. It is prominently ribbed lengthwise

throughout, and set closely along the summits of the ridges are clusters of very sharp stout radiating spines sometimes 2 in. or more in length, and effectually protecting the green epidermis of the plant behind them.

HABITAT. — The Saguaro is found in western Arizona, south of the Colorado plateau, southward throughout southern Arizona west of San Pedro river, and southward into Mexico. Its sentinel-like trunks are curious objects of interest to travelers crossing southern Arizona, where it is found in dry gravelly soil and among rocks where few other plants can maintain existence.

PHYSICAL PROPERTIES. — The Saguaro trunk consists of a frame work of fibro-vascular bundles in the form of a circle of poles at a little distance apart, and enveloped in a soft juicy parenchymatous tissue which also forms the center of the stem.

The arrangement of the tissues of these stems we have found we are able to show in our sections much better than anticipated at the outset. We expected the soft tissues would not hold together, but found them amply strong. In decomposition of the stems the soft tissues soon disintegrate, leaving the frame work cluster of poles, which are strong but very light, with conspicuous medullary rays radiating from the innermost side, and with annual layers of growth quite distinctly marked. The wood of these poles is of a light yellowish brown, and when perfectly dry have a specific gravity of 0.3188, a cubic foot weighing 19.87.*

USES. — The woody poles are used for the rafters of adobe houses, for fencing, and by the Indians for lances and bows. The fruit is an article of food for the Indians and is also eaten by certain birds.

ORDER CAPRIFOLIACEÆ: HONEYSUCKLE FAMILY.

Leaves opposite and mostly without stipules. *Flowers* perfect, 4-5 numerous; calyx-tube coherent with the ovary; petals united, forming a tubular or rotate corolla; stamens inserted in the corolla and usually as many as its lobes; pistil with inferior 2-8-celled ovary containing two to many anatropous ovules. *Fruit* a berry drupe or pod; seed with small embryo and fleshy albumen.

Order composed mostly of shrubs, a few trees and a few herbs.

GENUS SAMBUCUS, TOURNEFORT.

Leaves unequally pinnate, destitute of stipules, leaflets serrate, pointed; leaf-buds scaly; branchlets stiff and containing large pith. *Flowers* small, regular and perfect (rarely polygamous), articulated with small pedicels, in broad terminal compound cymes; calyx-tube adnate to the ovary, with 3-5 broadly spreading lobes; corolla with 3-5 equal lobes broadly spreading, white (or tinted with yellow or red); stamens 5, inserted on the corolla, alternate with its lobes; stamens with extrorse versatile 2-celled anthers, attached by the back and opening longitudinally; pistal with mostly inferior 3-5-celled ovary, short thick style and terminal

* Sargent's *Silva*, vol. V, p. 54.

3.5-lobed stigma, each cell of the ovary containing a single suspended ovule. *Fruit* a drupe-like juicy subglobose berry, tipped with the remnants of the style and containing 3-5 nutlets, each containing an oblong compressed seed with membranous testa, fleshy albumen and minute embryo.

Genus composed of trees and shrubs (rarely perennial herbs), having a rank smell when bruised. The name is the classical name of the Elder tree of Europe, and is supposed to be derived from the Greek *δάμβύκη*, a musical instrument, probably alluding to a use of the pithy shoots.

229. *SAMBUCUS MEXICANA*, PRESL.*

MEXICAN ELDER.

Ger., *Mexicanischer Holunder*; Fr., *Sureau de Mexico*; Sp., *Sauco de Mexico*.

SPECIFIC CHARACTERS:—*Leaves* and young shoots more or less pubescent, with stout petioles about $\frac{1}{2}$ in. long and usually five ovate-lanceolate acuminate leaflets, which are sharply serrate except at their bases, 1 1-2 to 6 in. long (the lowermost the smallest), rather firm, cuneate or rounded and somewhat inequilateral at base; petioles slender, that of the terminal leaflet much the longest; stipules occurring on vigorous shoots serrate; branchlets after the first year light reddish brown with elevated lenticles; pith white. *Flowers* (March to July) about 1-8 in. across, in large flat or depressed pubescent compound cymes, 6-8 in. across; calyx 5-lobed; corolla rotate, creamy white, with five rounded lobes; pistil ovoid, thick and fleshy. *Fruit* about 1-4 in. in diameter, nearly black, juicy and destitute of bloom.

A tree sometimes 30 ft. (9 m.) in height with characteristic rather irregular top of spreading branches and often twisted trunk 12 to 18 in. (0.45 m.) in diameter, but usually a considerably smaller tree, with yellowish-green cast of foliage, and a rather soft grayish brown fibrous bark having prominent longitudinal and obliquely connecting ridges.

HABITAT.—The Mexican Elder is found along streams and in moist bottom lands from the valley of the Nueces river in southern Texas westward, throughout southern New Mexico and Arizona, into southern California and southward through Mexico to Central America. Isolated from these regions by a long step it has also been found in Plumes county, northern California.

PHYSICAL PROPERTIES.—The wood of the Mexican Elder is soft, light, not strong, of rather coarse grain with thin medullary rays, and of a light brown color with light yellowish-white sap-wood. *Specific Gravity*, 0.4614; *Percentage of Ash*, 2.00; *Relative Approximate Fuel Value*, 0.4522; *Weight of a Cubic Foot in Pounds*, 28.75.

USES.—The wood of this tree is of little economic importance, though the tree itself deserves attention for ornamental planting, owing to its large handsome flower-clusters and later bunches of fruit. It is occasionally planted as a shade tree and for its fruit which is edible and especially prized for jellies, etc.

* *S. Canadensis*, Var. *Mexicana*, Sarg.

ORDER **ERICACEÆ**: HEATH FAMILY.

Leaves commonly alternate, but sometimes opposite and rarely whorled, without stipules. *Flowers* regular, symmetrical, perfect and 4-5-numerous; corolla present and lobed or of distinct petals; stamens as many as the lobes of the corolla, or twice as many, free from it, but inserted with it on an annular disk: anthers usually introrse, commonly appendaged and opening by terminal chinks or pores, pollen compound, of 4 united grains (except in a few herbaceous species, the *Monotropeæ*); pistil with single style, superior or inferior ovary, having as many cells as the lobes of the corolla, or rarely fewer. *Fruit* a berry, drupe or capsule with small anatropous seeds having small embryo in fleshy albumen.

A large family, mainly of shrubs, but a few trees and herbs, and quite various in characters.

GENUS **ARBUTUS**, TOURNEFORT.

Leaves alternate, coriaceous, petiolate, entire or toothed (sometimes in the same plant), obscurely pinnately veined, without stipules and persistent. *Flowers* small, white or pinkish, in terminal panicles, with pedicels developed each from the axils of usually two ovate membranous and persistent bracts; calyx small, free from the ovary, 5-parted nearly to the base, the lobes acute, membranous and persistent, corolla gamopetalous, hypogynous, subglobose or urn-shaped, white, pinkish or greenish and with 5, recurved, obtuse teeth, imbricated in æstivation, stamens 10, included, inserted on the bottom of the corolla, filaments dilated and hairy at base and anthers 2-celled, short, laterally compressed, introrse, furnished near the summit behind with two reflexed awns, cells opening each by a pore near the top anteriorly; pistil with single columnar exerted style with terminal obscurely 5-lobed stigma and 5-celled ovary sessile upon the hypogynous glandular disk, the cells containing numerous anatropous ovules attached to central placentæ. *Fruit* a globose berry with smooth or granular surface, 5-celled, and with several small compressed pointed seeds in each cell, with axil embryo in copious hard albumen.

A genus of few species of interesting trees and shrubs of the warmer temperate regions of both hemispheres. (*Arbutus* is the ancient Latin name of the European species.)

230. **ARBUTUS ARIZONICA** (GREY) SARG.

ARIZONA MADROÑA.

Ger., *Arizonischer Erdbeerbaum*; Fr., *Arbousier d'Arizona*; Sp., *Madroña de Arizona*.

SPECIFIC CHARACTERS:—*Leaves* lanceolate or occasionally oblong-lanceolate, 2-3 in. long, acute at apex, wedge-shaped at base, with thick entire or (particularly on vigorous shoots) serrate-dentate margins, rather thin, puberulous at first but at maturity glabrous, rigid, light green above, paler beneath, yellowish mid-ribs and obscure veinlets; petioles rather slender $\frac{1}{4}$ -1 in.; branchlets bright red with bark separating into thin papery scales. *Flowers* (May) about $\frac{1}{4}$ in. long, with pubescent pedicels, in loose terminal compound racemes 2 or $2\frac{1}{2}$ in. in length and breadth, the uppermost from the axils of scaly bracts, the lowermost from the axils of leaves; calyx lobes scarious; corolla white, globular-ovoid with reflexed 5-lobed limb; pistil with club-shaped style and glabrous porulose ovary. *Fruit* ripens in autumn, a subglobose dark red porulose drupe, about $\frac{1}{3}$ in. in diameter, with thin sweet flesh and a thin walled 5-celled pit.

This interesting tree attains the height of 40-50 ft. (15 m.) and 2 ft. (0.60 m.) or more in diameter of trunk. As we have seen it in the Chiricahua mountains of southeastern Arizona it usually divides near the ground into two or three spreading trunk-like branches, forming an irregular open head of very tortuous branches. Its bark is singu-

larly characteristic, that of the branches being very smooth and of a dark red color, exfoliating in thin papery sheets, and that of the old trunks is of a light gray color on the outer surface, fissured into shallow rounded ridges which exfoliate in thin curved scales. It is a handsome tree at all seasons of the year, owing to the striking contrast in color of the branches and foliage, but particularly so when bearing its numerous clusters of white waxen flowers or later its scarlet fruit.

HABITAT. — The Arizona Madroña has usually been considered as found only on the Santa Catalina and Santa Ana mountains of southern Arizona and the mountain ranges to the southward in Mexico. The writer, however, has found it in considerable abundance in extreme southeastern Arizona, on the Chiricahua mountains above Fort Rucker, thus extending its known range within the United States considerably to the eastward. It is found scattered over dry gravelly slopes and benches at elevations of from six to eight thousand feet altitude.

PHYSICAL PROPERTIES. — Wood rather soft though heavy, brittle, close-grained, with very numerous fine medullary rays and quite evenly distributed fine ducts. It is of a light reddish-brown color with lighter sap-wood. *Specific Gravity*, 0.7099; *Percentage of Ash*, 0.26; *Relative Approximate Fuel Value*, 0.7081; *Coefficient of Elasticity*, 61577; *Modulus of Rupture*, 618; *Resistance to Longitudinal Pressure*, 401; *Resistance to Indentation*, 247; *Weight of a Cubic Foot in Pounds*, 44.24.

USES. — It is too uncommon or inaccessible a wood to have attracted attention commercially, but the tree itself would seem to deserve greater popularity for ornamental planting than has hitherto been accorded it.

ORDER OLEACEÆ: OLIVE FAMILY.

Leaves opposite and single or pinnately compound. *Flowers* monopetalous (rarely apetalous or polypetalous); calyx 4-cleft, toothed or entire, or sometimes wanting, corolla regular, 4-cleft (or sometimes 4-petalous, or even wanting altogether); stamens only 2 (or rarely 4); ovary 2-celled with usually two suspended ovules in each cell. *Fruit* fleshy or capsular, containing 4 (or fewer) seeds.

GENUS FRAXINUS, TOURNEFORT.

Leaves petioled, oddly-pinnate, with 3-15 toothed or entire leaflets. *Flowers* small, racemed or paniced, from the axils of the last year's leaves, the American representatives dioecious and apetalous; calyx and corolla, when present, as described for the order; anthers large, linear or oblong; style single, stigma 2-cleft. *Fruit* a 1-2-celled, flattened samara, winged at the apex, 1-2 pendulous seeds in each cell.

(The ancient Latin name of the Ash; supposed to be from the Greek φράξις, *a separation*, alluding to the facility with which the wood splits.)

231. *FRAXINUS DIPETALA*, HOOK. & ARN.

FRINGE-FLOWER ASH.

Ger., *Fransenblühende Esche*; Fr., *Frêne à fleurs de frange*; Sp.,
Fresno de flores de franja.

SPECIFIC CHARACTERS:—*Leaves* 2-6 in. long and with 3-9 rather thick oval or oblong leaflets, which are $\frac{1}{2}$ -2 in. long, rounded or acute at apex, wedge-shaped at base, serrate above the middle, glabrous, dark green above, paler beneath and varying from nearly sessile to long petiolulate; branchlets terete or slightly 4-angled, dark green at first but finally reddish brown marked with pale lenticels. *Flowers* in clusters of narrow panicles, 2-3 in. long, mostly from the axils of the leaves of the previous year, with puberulous pedicels from $\frac{1}{4}$ to $\frac{1}{2}$ in. in length; calyx puberulous outside, about $\frac{1}{16}$ in. long, 4-parted or almost entire; petals 2, creamy white, ovate with short claw, about $\frac{1}{2}$ in. long, thin; stamens about as long as the petals, with slender filaments and ample linear anthers; pistil with ovate ovary and slightly lobed style. *Fruit* narrow spatulate-oblong, about 1 in. in length, the wing rounded and mostly retuse at apex and about as long as the flat seed bearing portion.

Var. *brachyptera*, Gray, is the name given to a form found in the vicinity of Borax Lake, Cal., having obovate keys only $\frac{1}{2}$ - $\frac{3}{4}$ in. long, the terminal part of the wing only half the length of the body.

Var. *trifoliata*, Torr., is a form found near the southern boundary of California, having 1-3 small coriaceous obscurely serrate leaflets, one inch or less in length and rather small fruit.

The Fringe-flower Ash is a small tree rarely surpassing a height of 25 or 30 ft. (9 m.) or 10-12 in. (0.30 m.) in thickness of trunk, which is vested in a grayish-brown bark checking with age into shallow ridges and exfoliating in irregular friable elongated scales. Only in favored localities, however, does it become a tree, it being generally a shrub with many stems from a single base.

HABITAT.—The coast region and western foot hills of the Sierra Nevada mountains of California and southward into lower California.

PHYSICAL PROPERTIES.—Wood rather hard, strong, heavy, coarse-grained with small medullary rays and annual layers distinctly marked by large open ducts. It is of a yellowish-brown color with thick lighter sapwood. We believe the specific gravity, etc., of this wood have not been determined.

USES.—The representatives of this species only rarely attaining the dimensions of trees, are of little economic importance.

ORDER *PLATANACEÆ*: PLANE-TREE FAMILY.

Leaves simple, alternate, palmately-veined and lobed, with sheathing scarious stipules. *Flowers* monœcious, destitute of both calyx and corolla, in separate and globular heads. *Sterile flowers* numerous; stamens intermixed with small, club-shaped scales; filaments very short; anthers 2-celled, linear. *Fertile flowers*: pistils intermixed with little scales; ovaries inversely pyramidal; style simple, awl-shaped, stigmatic on one side. *Fruit* small, club-shaped, coriaceous nutlets, with bristly tawny down at base, arranged in globose heads and containing a single, pendulous, albuminous seed.

Represented by trees.

GENUS PLATANUS, L.

Characters as given for the order, this being the only genus.

(The name *Platanus* is from the Greek, πλατύς, *broad*, probably in reference to the leaves.)

232. PLATANUS WRIGHTII, WATS.

ARIZONA SYCAMORE.

Ger., *Arizonische Platane*; Fr., *Platane d'Arizona*; Sp., *Platano de Arizona*.

SPECIFIC CHARACTERS:— *Leaves* deeply 3-7-lobed (usually 5-lobed) with narrow pointed sinuses and long acute entire or dentate lobes, varying from heart shaped to cuneate at base, 6-8 in. long and of about the same width, light green and glabrous above, paler and pubescent beneath; petioles stout, $1\frac{1}{2}$ 3 in. long. *Flowers* in globular heads arranged in racemes of 2-4 each with whitish tomentose peduncles. *Fruit* in globular heads about $\frac{3}{4}$ in. in diameter, with slender glabrous stems 6-8 in. in length, the achenia about $\frac{1}{4}$ in. long, glabrous and truncated at apex.

The specific name, *Wrightii*, commemorates the discoverer of the species Mr. Charles Wright.

The Arizona Sycamore attains the height of 70-80 ft. (24 m.) with trunk sometimes 4 or 5 ft. (1.50 m.) in diameter, dividing into a few massive branches and spreading characteristic irregular head with angular branches. The bark near the bases of large trunks is thick, of a grayish brown color, fissured into narrow ridges and exfoliating in rounded or oblong minutely pitted scales. That of young trunks and branches exfoliates in large irregular plate-like scales and patches, leaving a clear creamy white or greenish color beneath which is the color of the smooth upper branches.

HABITAT.—The Arizona Sycamore marks the banks of streams in the mountain canoñs of southwestern New Mexico, Arizona south of the Colorado plateau, being in such localities the most conspicuous and characteristic tree up to an altitude of about 6000 ft.

In these regions of sun-burned rocks and trees of somber foliage the clean white branches and light green foliage of the Sycamores appear in delightful contrast.

PHYSICAL PROPERTIES.—Wood rather light and soft but strong, with quite uniformly distributed open ducts and large conspicuous medullary rays. The sap-wood is of a pinkish cream color near the bark and shades gradually into a light brown heart-wood. *Specific Gravity*, 0.4736; *Percentage of Ash*, 1.35; *Relative Approximate Fuel Value*, 0.4672; *Coefficient of Elasticity*, .45644; *Modulus of Rupture*, 428; *Resistance to Longitudinal Pressure*, 327; *Resistance to Indentation*, 117; *Weight of a Cubic Foot in Pounds*, 29.51.

USES.—The Arizona Sycamore is not a wood of commercial importance though of a highly ornamental nature and possessing the same useful properties that are found in the eastern species.

ORDER JUGLANDACEÆ: WALNUT FAMILY.

Leaves alternate, pinnate and without stipules. *Flowers* monœcious and apetalous, except in some cases in the fertile flowers. *Sterile flowers* in catkins with an irregular calyx adnate to the scale of the catkin. *Fertile flowers* solitary or in small clusters, with calyx regularly 3-5-lobed, adherent to the incompletely 2-4-celled, but 1-ovuled ovary. *Fruit* a sort of dry drupe (a tryma), with a fibrous and more or less fleshy and coriaceous outer coat very astringent to the taste, a hard, bony inner coat, and a 2-4-lobed seed, which is orthotropous, with thick, oily and often corrugated cotyledons and no albumen.

All representatives of the order are trees.

GENUS JUGLANS, L.

Leaves odd-pinnate, with numerous serrate leaflets; leaf-buds few-scaled or nearly naked. *Sterile flowers* in long, simple, imbricated, axillary catkins from the wood of the preceding year; calyx unequally 3-6-cleft; stamens 12-40 with very short and free filaments. *Fertile flowers* several in a cluster or solitary at the ends of the branches; calyx 4-toothed and bearing in its sinuses 4 small petals; styles 2, very short; stigmas 2, somewhat club shaped and fringed. *Fruit* drupaceous with a fibrous and spongy, somewhat fleshy, indehiscent epicarp and a rough irregularly furrowed endocarp; embryo edible and wholesome.

Trees with strong-scented resinous-aromatic bark and a pith which separates into thin transverse disks. (*Juglans* is contracted from Latin *Jovis glans*, the nut of Jove.)

233. JUGLANS RUPESTRIS, ENGELM.

MEXICAN WALNUT, ARIZONA WALNUT.

Ger., *Arizonischer Wallnuszbaum*; Fr., *Noyer d'Arizona*; Sp., *Nogal de Arizona*.

SPECIFIC CHARACTERS:—*Leaves* from 15-17 in. in length, with pubescent petioles and 9-23 lanceolate to ovate-lanceolate acuminate leaflets which are 2 1-2-5 in. long, quite inequalateral, short-petiolate or nearly sessile, thin and glabrous or somewhat pubescent especially beneath. *Flowers* (April to May) the staminate in slender puperulous catkins from 2 1-2-4 in. in length, with ovate-lanceolate acute pale-tomentose scales; perianth 3-5-lobed, light yellowish green; stamens about 20 with nearly sessile yellow anthers and slightly lobed connectives; pistillate flowers in few-flowered spikes, tomentose and from 1-8-1-4 in. in length; bractlets puberulous at apex, laciniate; calyx lobes puberulous outside; stigmas about 1-3 in. long, plumose, spreading, greenish red. *Fruit* subglobose, 1-2-1 1-2 in. long, with thin glabrate epicarp and globose or laterally compressed nut, blackish, deeply sulcate, thick-walled, without sutural ridges and containing a sweet edible kernel.

The specific name, *rupestris*, from the Latin *rupes*, a rock, is significant of the nature of the regions in which this tree is found.

A handsome tree occasionally attaining a height of 50 ft. (15 m.) with a trunk 4 or 5 ft. (1.50 m.) in diameter, covered with grayish brown bark, fissured into longitudinal and obliquely connecting ridges which exfoliate in thick elongated fibrous scales.

The trunk is generally short, divided at from 6-8 ft. from the ground into large branches, most of which grow out horizontally, or droop downwards and all conform into a low symmetrical wide top.

HABITAT.—Central Texas, the upper Colorado, Llano and Guadalupe Rivers, westward through southern New Mexico and Arizona, where it attains its largest dimensions, and southward into northern Mexico. It is found along the banks of streams and in mountain canons up to an altitude of about 6000 ft. It is often shrubby in the extreme eastern portion of its range.

PHYSICAL PROPERTIES.—The wood of the Arizona Walnut is heavy, of moderate hardness and strength, with large open ducts irregularly distributed, of a rich dark brown color with yellowish white sap-wood, when freshly cut, but quickly assuming a light brown color on exposure to the atmosphere. *Specific Gravity*, 0.6554; *Percentage of Ash*, 1.01; *Relative Approximate Fuel Value*, 0.6488; *Coefficient of Elasticity*, 72632; *Modulus of Rupture*, 600; *Resistance to Longitudinal Pressure*, 437; *Resistance to Indentation*, 182; *Weight of a Cubic Foot in Pounds*, 40.84.

USES.—The nuts of this tree are prized by the Mexicans and Indians as an article of food though too small and with too hard shells to have attained any commercial importance. Little use is made of its wood owing to the sparseness of the population of the regions in which the tree is found and its inconvenient dimensions.

ORDER CUPULIFERÆ: OAK FAMILY.

Leaves alternate, simple, straight veined; the stipules, forming the bud-scales, deciduous. *Flowers* monœcious, apetalous. *Sterile flowers* in clustered or racemed catkins (or in simple clusters in the Beech); calyx regular or scale-like; stamens 5-20. *Fertile flowers* solitary, clustered or spiked, and furnished with an involucre which forms a cup or covering to the nut; calyx-tube adherent to the ovary, its teeth minute and crowning the summit; ovary 2-7-celled with 1-2 pendulous ovules in each cell, but all of the cells and ovules, except one, disappearing before maturity; stigmas sessile. *Fruit* a 1-celled, 1-seeded nut, solitary or several together and partly or wholly covered by the scaly (in some cases eclinate) involucre cup or covering; seed albumenless, with an anatropous, often edible, embryo; cotyledons thick and fleshy.

Genus is represented by both trees and shrubs.

GENUS QUERCUS, L.

Flowers greenish or yellowish. *Sterile flowers* in loose, slender, naked catkins, which spring singly or several together from axillary buds; calyx 2-8-parted or cleft; stamens 3-12; anthers 2-celled. *Fertile flowers* with ovary nearly 3-celled and 6-ovuled, two of the cells and 5 of the ovules being abortive; stigma 3-lobed; involucre developing into a hard, scaly cup around the base of the nut or acorn, which is 1-celled, 1-seeded.

(*Quercus* is the ancient Latin name for the Oak supposed to be from the Celtic *quer*, *fine*, and *cuez*, *tree*.)

234. QUERCUS EMORYI, TORR.

EMORY OAK. ARIZONA BLACK OAK.

Ger., *Eiche von Emory*; Fr., *Chêne d'Emory*; Sp., *Roble de Emory*.

SPECIFIC CHARACTERS: — *Leaves* oblong-lanceolate, from 1-2½ in. in length, acute, cordate or rounded at base, entire or repand-serrate with 1-5 pairs of mucronate teeth, pubescent at first but at maturity glabrous or stellate-puberulous, coriaceous, lustrous dark green above, paler and with whitish pubescence at the base beneath, persistent during the winter and until after the appearance of new leaves. *Flowers* appear in April, the staminate in hoary-tomentose aments 2-3 in. in length; calyx light yellow, 5-7-lobed, pubescent outside; stamens with short filaments and large yellow oblong anthers; pistillate flowers sessile or nearly so, hoary-tomentose. *Fruit* acorns maturing the first season, sessile or nearly so, with oblong-ovoid nut, ½-¾ in. long, whitish tomentose within and ⅓-½ in. invested by the cup, which is nearly hemispherical and with close imbricated thin scarious light brown pubescent scales; cotyledons yellow and of sweetish flavor.

The specific name commemorates the name of Col. W. H. Emory who discovered this species in southern New Mexico.

A beautiful and distinct oak attaining the height of 60 or 70 ft. (20 m.) with a trunk diameter of 3 or 4 ft. (1.20 m.) having a very dark brown bark deeply fissured into small firm square and oblong plates which exfoliate in fragments and thick scales. Its trunk usually divides within a few feet of the ground into sturdy arching branches, the lowermost of which rise obliquely and a rather flattened oboeonic head is formed. Along the large trunks many small branches are given out which form flattened sprays of shining dark green foliage. These features give this oak an individuality and beauty which at once distinguish it from all other trees in the region in which it grows.

HABITAT. — The Emory Oak is found on the mountains of western Texas, southern New Mexico and Arizona, south of the Colorado plateau, and southward into Mexico. It grows in considerable abundance in the open forests which clothe the mountain slopes, but attains its best development and beauty in the sheltered canons of the mountains of southern Arizona.

PHYSICAL PROPERTIES. — Wood heavy, hard, strong, coarse-grained, with annual rings distinctly marked by large open ducts, and of a mottled dark and light brown color with lighter sap-wood. *Specific Gravity*, 0.9263; *Percentage of Ash*, 2.36; *Relative Approximate Fuel Value*, 0.9044; *Coefficient of Elasticity*, 63828; *Modulus of Rupture*, 703; *Resistance to Longitudinal Pressure*, 422; *Resistance to Indentation*, 415; *Weight of a Cubic Foot in Pounds*, 57.73.

USES. — The edible acorns of the oak are highly valued by the Mexicans and Indians as an article of food and are of commercial importance in the towns of southern Arizona and northern Mexico.

235. QUERCUS HYPOLEUCA. ENGELM.

WHITE-LEAF OAK.

Ger., *Weiszblättrige Eiche*; Fr., *Chêne à feuilles blanches*; Sp., *Roble de hojas blancas*.

SPECIFIC CHARACTERS: — *Leaves* lanceolate to oblong-lanceolate, from 2-4 in. long, acute at apex, cuneate, rounded or somewhat cordate at base, with entire revolute or occasionally remotely dentate margin, pubescent at first, at maturity thick and firm, lustrous dark green above and woolly beneath with white tomentum, persistent until after the appearance of new leaves; petioles $\frac{1}{2}$ - $\frac{1}{4}$ in. long, pubescent. *Flowers* open in April, the staminate in slender pale-tomentose aments 3-4 in. long; calyx pubescent outside, deeply 4 or 5-lobed; stamens 4, exserted, with slender filaments and ovate apiculate anthers; the pistillate flowers are usually single or in pairs, sessile or short pedunculate; stigmas dark red, recurved. *Fruit* acorns maturing the second season, usually solitary and sessile or with short peduncles; the nut ovoid from $\frac{1}{2}$ - $\frac{3}{4}$ in. long, acute or rounded at the hoary-pubescent apex, dark green and striated at first but drying to a uniform chestnut brown; shell light tomentose within; cup turbinate, about one-third enveloping the nut and covered with thin chestnut brown pubescent scales.

The specific name, *hypoleuca*, is from Greek words, meaning *white beneath*.

This interesting oak occasionally attains the height of 40 or 50 ft. (15 m.) with rather narrow rounded top and trunk 12-15 in. (0.35 m.) in diameter, covered with a dark gray bark deeply fissured into irregular broken ridges which flake off in thick fragments.

It is one of the most beautiful of our oaks owing to its curious parti-colored foliage, the silvery white under surfaces of its leaves contrasting strongly with the lustrous dark green of the upper surfaces as they are turned up by the wind. In localities where conditions do not favor its fullest development it is found reduced to a shrub.

HABITAT. — The mountains of Texas, New Mexico and Arizona south of the Colorado plateau and southward into Mexico. It is scattered over the mountain slopes among the Chiricahua Pines, Madroñas, etc., at an altitude of six or seven thousand feet above tide, seeming to be nowhere very abundant.

PHYSICAL PROPERTIES. — The wood is very heavy, hard, strong, with numerous large medullary rays, and of a very dark brown color with thick brownish white sap-wood. *Specific Gravity*, 0.8009; *Percentage of Ash*, 1.34; *Relative Approximate Fuel Value*, 0.7902; *Coefficient of Elasticity*, 94409; *Modulus of Rupture*, 1113; *Resistance to Longitudinal Pressure*, 293; *Resistance to Indentation*, 272; *Weight of a Cubic Foot in Pounds*, 49.91.

USES. — The wood, though of valuable properties, is little used owing to sparseness of population and its limited abundance.

The distinct and beautiful foliage of the tree would seem to insure its popularity for ornamental planting, and it will no doubt when it becomes more generally known be propagated for that purpose.

ORDER **BETULACEAE**: BIRCH FAMILY.

Leaves simple, alternate, straight-veined and furnished with stipules which fall away early. *Flowers* mostly naked, monoecious, both kinds in catkins, 2 or 3 together under a 3-lobed bract or scale. *Sterile flowers* with distinct stamens and 2-celled anthers. *Fertile flowers* with two thread-like stigmas, and a 2-celled ovary, each cell containing 2 pendulous ovules, becoming by abortion in *Fruit*, a small, 1-celled, 1-seeded nutlet, often with membranous wings: seed anatropous, albumenless, with flattish, oblong cotyledons which become foliaceous in germination.

Trees or shrubs, with bark which separates more or less easily into thin layers

GENUS **BETULA**, TOURNEFORT.

Leaves ovate, serrate; these, with the twigs, especially the latter, often spicy aromatic. *Flowers* appearing in early spring with or before the leaves. *Sterile flowers* in long, drooping, cylindrical, both terminal and lateral, yellow catkins, appearing in summer and remaining dormant during the following winter to open and perform their function early the next season; bracts 3-lobed, shield-shaped, and beneath each are 2 bractlets and 3 flowers with calyx represented by a mere scale, which bears the 4 short stamens, each with a single-celled anther. *Fertile flowers* in cylindrical or oblong catkins with 3-lobed scales, and beneath each scale are 2-3 naked pistils without bractlets or calyx. *Fruit* a small, broadly-winged, scale-like nutlet or samara.

Trees and shrubs with outer bark horizontally fibrous and usually separable in sheets, that of the branchlets dotted, inner bark more or less aromatic and of pleasant flavor. (The ancient Latin name, from Celtic *Betu*, birch.)

236. **BETULA OCCIDENTALIS**, Hook.

WESTERN BIRCH. PUGET SOUND BIRCH.

Ger., *Westliche Birke*; Fr., *Bouleau occidental*; Sp., *Abedul occidental*.

SPECIFIC CHARACTERS.—*Leaves* ovate, 3-4 in. long, acute, rounded (rarely cuneate) at base, irregularly and usually doubly serrate, at first pale green dotted with resin glands and villous along the midribs, at maturity firm, pitted with the scars of the fallen resin glands, dark green above, paler and puberulous along the veins beneath; petioles about 3-4 in. long, glandular, grooved, pubescent; stipules oblong-ovate, glandular-viscid, about $\frac{1}{2}$ in. long; branchlets pubescent and glandular at first, the second season glabrous, orange-brown marked with pale lenticels. *Flowers* open in May, the staminate catkins 3-4 in. in length, and the pistillate $\frac{1}{2}$ – $\frac{3}{4}$ in. *Fruit* oblong-cylindrical pendulous strobiles, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. in length and $\frac{1}{2}$ in. or less in thickness, borne on stout peduncles about $\frac{3}{4}$ in. long, the scales much longer than broad, puberulous outside with elongated terminal lobe and spreading lateral lobes, gradually narrowing to base; nutlet ovoid, about $\frac{1}{16}$ in. long and wings somewhat wider.

The Western Birch attains the height of upwards of 100 ft. (30 m.) with trunk 3 or 4 ft. (1 m.) in diameter, vested in a thin lustrous orange-brown and pearl-colored bark, marked with large raised lenticels and peeling off in papery layers, and strips transversely around the trunk.

HABITAT.—Southwestern British Columbia, Vancouver Island and northwestern Washington, growing in moist alluvial bottom-lands and along the banks of streams.

PHYSICAL PROPERTIES. — Wood quite heavy, hard, strong, with fine medullary rays and ducts uniformly distributed. *Specific Gravity*, 0.6030; *Percentage of Ash*, 0.30; *Relative Approximate Fuel Value*, 0.6012; *Coefficient of Elasticity*, 92424; *Modulus of Rupture*, 806; *Resistance to Longitudinal Pressure*, 391; *Resistance to Indentation*, 127; *Weight of a Cubic Foot in Pounds*, 37.58.

USES. — A valuable wood for all the uses to which the Canoe Birch is applied, as in the manufacture of wooden ware, furniture, etc., though not abundant enough to be available in large quantities.

ORDER SALICACEÆ: WILLOW FAMILY.

Leaves alternate, simple, undivided and furnished with stipules, which are either scale-like and deciduous, or leaf-like and persistent. *Flowers* diœcious, both kinds in catkins, one under each bract or scale of the catkin and destitute of both calyx and corolla, or the former represented by a gland-like cup; ovary 1 to 2-celled; styles wanting, or 2 and short; stigmas often 2-lobed. *Fruit* a 1 or 2-celled, 2-valved pod, with numerous seeds springing from two parietal or basal placentæ and furnished with long, silky down; seeds ascending, anatropous, with albumen; cotyledons flat.

Trees or shrubs of rapid growth, light wood and bitter bark.

GENUS SALIX, TOURNEFORT,

Leaves generally narrow, long and pointed and usually with conspicuous stipules; bud scales single. *Flowers* appearing before or with the leaves in terminal and lateral cylindrical, imbricated catkins, the scales or bracts of which are entire and each subtending a flower, which is without calyx, and bears at its base 1 or 2 small nectiferous glands. *Sterile flowers* with 2 (but sometimes more) distinct or united stamens. *Fertile flowers*: ovary ovoid lanceolate, taper-pointed; style short; stigmas 2, short and mostly bifid. *Fruit* a 1-celled pod, dehiscent at maturity by two valves which roll back to the summit to liberate the numerous minute comose seeds.

Trees and shrubs with lithe round branches and growing mostly along streams and in moist localities. (*Salix* is from the Celtic, *sal*, *near*, and *lis*, *water*, alluding to the favorite locality of the willows.)

237. SALIX LASIANDRA, BENTH.

WESTERN BLACK WILLOW.

Ger., *Westliche Schwarzweide*; Fr., *Saule noir occidental*; Sp., *Sauce negro occidental*.

SPECIFIC CHARACTERS: — *Leaves* convolute in the bud, 4.5 in. long, lanceolate, long taper-pointed, rounded or acute at base, sharply and finely serrate, pubescent at first but finally lustrous dark green above, paler beneath, with broad yellowish midribs; petioles from $\frac{1}{4}$ – $\frac{1}{2}$ in. in length, glabrous or pubescent and furnished with two or more dark glands near the base of blade; stipules semi-lunar, glandular-serrate, falling early except on vigorous shoots where they are larger and foliaceous. *Flowers* in pedunculate catkins $1\frac{1}{2}$ –2 in. long, terminating leafy branchlets; staminate catkins about $\frac{1}{3}$ in. in diameter, with obovate yellow glandular-dentate scales; stamens 5–9 with filaments free and hairy at the base, pistillate aments nearly $\frac{1}{4}$ in. in diameter; scales hairy, nearly entire; pistil with short stipe, lanceolate glabrous ovary, short style and spreading stigmatic lobes. *Fruit* capsules about $\frac{1}{4}$ in. long, reddish yellow.

Var. *S. Lyalli* Sarg. is characterized as follows: *Leaves* often 7-8 in. long, with rounded or subcordate base; petioles more glandular and scales of pistillate aments less hairy.

Var. *caudata* (Nutt.) Sudworth, is characterized as follows: *Leaves* thicker, more coriaceous, usually smaller and often falcate, wedge-shaped at base, and green both sides; staminate aments thicker, more densely flowered; scales dentate only near apex; branchlets yellow; buds larger and often villous below the middle.

The specific name, *lasiandra*, is from Greek roots meaning *hairy stamens*.

This willow occasionally attains the height of 60 ft. (18 m.) with yellowish ascending branches forming a rather irregular wide top with foliage tufted at the ends of the branchlets, and trunk 2-3 ft. (0.80 m.) in diameter. The bark of trunk is of a grayish brown color, divided by shallow fissures into flat longitudinal ridges which exfoliate in elongated friable scales.

HABITAT. — California generally, west of the Sierra Nevada mountains. In western Oregon, Washington and southern British Columbia it is commonly represented by var. *Lyalli*, one of the most beautiful of American Willows. The var. *caudata* is found among the Sierra Nevada mountains and in the interior of the continent from northern Montana southward to Colorado and northern New Mexico, growing along the banks of streams, on lake shores and in moist bottom-lands.

PHYSICAL PROPERTIES. — The wood of this species is light, soft, not strong, brittle, with fine obscure medullary rays and quite uniformly distributed fine ducts. It is of a yellowish brown color with thick lighter sap-wood. *Specific Gravity*, 0.4756; *Percentage of Ash*, 0.60; *Relative Approximate Fuel Value*, 0.4727; *Weight of a Cubic Foot in Pounds*, 29.64.

USES. — The highly ornamental nature of the variety *Lyalli* would suggest its usefulness for ornamental planting. Little use is made of the wood, though suitable for charcoal and other purposes.

238. SALIX SITCHENSIS, SANS.

SILKY WILLOW. SITKA WILLOW.

Ger., *Weide von Sitka*; Fr., *Saule de Sitka*; Sp., *Sauce de Sitka*.

SPECIFIC CHARACTERS: — *Leaves* conduplicate in the bud, oblong-obovate, to oblanceolate, 2-5 in. long, acute or obtuse with an abrupt point at apex, wedge-shaped at base, entire or obsoletely crenulate, pubescent at first at maturity, lustrous dark green above, with the exception of a pale pubescence along the stout midribs, white satiny tomentose beneath; petioles stout, pubescent, grooved, scarcely $\frac{1}{2}$ in. in length; stipules usually small falling away early, but on vigorous shoots foliaceous and $\frac{1}{2}$ in. in length; branchlets tomentose the first season and may be pubescent or glabrous and glaucous the second season; winter buds about $\frac{1}{4}$ in. long, puberulous, light brown. *Flowers* in slender erect densely-flowered aments bearing small acute scale-like leaves at their bases; staminate aments $1\frac{1}{2}$ -2 in. long, $\frac{1}{2}$ in. broad, with yellow oblong-obovate scales rounded at apex

and sparsely villous; stamens solitary, with long glabrous filament or sometimes two united below; pistillate aments $2\frac{1}{2}$ –3 in. long and scarcely $\frac{1}{4}$ in. broad with short pointed pubescent scales; pistil with short stalked ovary, pubescent, elongated style and entire or slightly emarginate stigma. *Fruit* capsules about $\frac{1}{4}$ in. long, acute-ovoid, light reddish brown, pubescent; aments at maturity of fruit 3 or 4 in. long.

The specific name *Sitchensis* alludes to the occurrence of this species in the vicinity of Sitka, Alaska, which was the place of its discovery.

A beautiful willow, commonly a large shrub but occasionally a low straggling tree, it is rarely over 30 ft. (9 m.) in height or more than 1 ft. (0.30 m.) in thickness of trunk, which is vested in a reddish brown bark furrowed lengthwise with low ridges which exfoliate in thin small scales. It is conspicuous on account of the silvery whiteness of the under surface of its leaves in strong contrast with the dark green of the upper surfaces.

HABITAT. — The Silky Willow is confined to the immediate vicinity of the Pacific coast, and ranges from Cook Inlet and Kadiak Island, Alaska, southward through Washington, Oregon, and as far in California as Santa Barbara, overhanging the banks of streams and the borders of lakes, and in other moist situations up to an altitude of at least fourteen hundred feet above tide.

PHYSICAL PROPERTIES. — Wood light, soft, not strong, with fine obscure medullary rays and quite uniformly distributed fine ducts. It is of a light orange-brown color with lighter sap-wood. *Specific Gravity*, 0.5072; *Percentage of Ash*, 0.59; *Relative Approximate Fuel Value*, 0.5042; *Weight of a Cubic Foot in Pounds*, 31.61.

USES. — The wood of this willow is said to be prized by the Indians of southern Alaska for frying salmon as the smoke does not impart a disagreeable flavor, and the pounded bark is used as an application for bleeding flesh wounds.

GYMNOSPERMÆ.

Flowering, exogenous plants with *leaves* chiefly parallel-veined and cotyledons frequently more than two. *Flowers* diclinous and very incomplete; pistil represented by an open scale or leaf, or altogether wanting, with ovules naked, fertilized by direct contact with the pollen, and seeds at maturity naked — without a true pericarp.

ORDER CONIFERÆ: PINE FAMILY.

Leaves mostly awl-shaped or needle shaped, evergreen, entire and parallel-veined. *Flowers* monoecious, or rarely dioecious, in catkins or cones, destitute of both calyx and corolla; stamens one or several (usually united); ovary, style and stigma wanting; ovules one or several at the base of a scale, which serves as a carpel, or on an open disk. *Fruit* a cone, woody and with distinct scales, or somewhat berry-like, and with fleshy coherent scales, seeds orthotropous, embryo in the axis of the albumen.

Trees or shrubs with a resinous juice.

GENUS CUPRESSUS, TOURNEFORT.

Leaves persistent, small, scale-like, decussately opposite, thick, rounded or keeled, adnate to and decurrent upon the stem, usually glandular-pitted on the back, appressed or slightly spreading at the pointed or rounded apex, margin entire or denticulate; leaves on vigorous young shoots commonly awl-shaped or linear lanceolate and spreading; branchlets not forming flat sprays. *Flowers* appear in early spring, monoecious, in small catkins terminating the leafy branchlets; the staminate aments oblong or cylindrical, consisting of a few pairs of decussately opposite, yellowish ovate or orbicular subpeltate scales attached to the under sides of each of which are two to six subglobose pendulous anther-cells opening by a longitudinal slit; pollen-grains simple. The pistillate flowers terminate short branchlets, subglobose; scales thick, ovate acute and bearing attached to their bases on the inner surface generally numerous, erect, orthotropous bottle-shaped ovules. *Fruit* a subglobose, short-stalked, rugose, woody cone, generally maturing the second year, scales closely valvate, peltate, polygonal in outline at apex, flattened and bearing more or less prominent central bosses, at maturity opening along their margins and persisting after liberating their numerous irregularly compressed acutely angled thick-coated seeds, which are borne in several rows on the base of the scale; embryo erect in fleshy albumen, cotyledons usually two.

Genus consists of resinous trees with generally fragrant wood of considerable economic value, especially in Japan. About a half dozen species are found in the United States along the Pacific slope.

(*Cupressus* is the classical Latin name of the Cypress tree.)

239. CUPRESSUS ARIZONICA, GREENE.

ARIZONA CYPRESS.

Ger., *Arizonische Cypresse*; Fr., *Cypress d'Arizona*; Sp., *Ciprés de Arizona*.

SPECIFIC CHARACTERS:—*Leaves* acute, about $\frac{1}{4}$ in. long, thick, acuminate, without glands or obscurely glandular—pitted on the bark, pale glaucous green and closely appressed, forming a nearly quadriangular branchlet. *Flowers* open in very early spring, the staminate in great profusion on the tips of branchlets, are oblong, nearly $\frac{1}{4}$ in. in length, and with 6-8 stamens bearing yellow peltate connectives slightly rugose on the margins. *Fruit* a puberulous subglobose pale brown cone $\frac{1}{2}$ – $\frac{3}{4}$ in. in diameter, thickly covered with a glaucous bloom, raised on a short peduncle and with generally six (sometimes 4 or 8) thick rugose scales with prominent incurved bosses, and beneath each are several irregularly compressed seeds from $\frac{1}{16}$ – $\frac{3}{16}$ in. in length, with thin light brown lateral margins which serve as narrow wings.

A tree occasionally attaining the height of 60 or 70 ft. (20 m.) with rather open wide pyramidal head of horizontal branches, and trunk sometimes 3 or 4 ft. (1 m.) in diameter, vested in a fibrous grayish brown bark fissured lengthwise in rather narrow ridges which exfoliate in strips, and these hanging a long time attached give a decidedly shaggy appearance to the older trunks.

HABITAT.—The Arizona Cypress is locally distributed on the mountains of central, eastern and southern Arizona and southward on the mountains of Sonora and Chiricahua, at elevations of from five to eight thousand feet above sea level. It is generally scattered among other trees as the Alligator Juniper, Chiricahua Pine, Arizona and

Emory Oaks, etc., but occasionally forming quite exclusive tracts of forests.

PHYSICAL PROPERTIES. — Wood very light, soft, close-grained, easily worked and of an orange-brown color with lighter sap-wood. *Specific Gravity*, 0.4843; *Weight of a Cubic Foot in Pounds*, 30.18.*

USES. — We believe little use has been made of this timber owing to the sparseness of populations in the regions in which it grows, though possessed of useful properties. The tree is grown to some extent for ornamental purposes and proves to be hardy in England.

GENUS CHAMAECYPARIS, SPACH.

Leaves evergreen, very small, scale-like, imbricated and closely appressed, or on vigorous shoots awl-shaped and free; leaf-buds not scaly; branchlets distichous and finely divided. *Flowers* monœcious, in small, terminal, few-flowered catkins. Sterile catkins ovoid, with filaments in the form of shield-shaped scales, each bearing beneath its lower margin 2-4 anther-cells, opening lengthwise. Fertile catkins globose with shield-shaped scales decussate, each bearing at its base several bottle-shaped, orthotropous ovules. *Fruit* a small, spherical cone, the thick, shield-shaped scales of which are furnished with a point or boss in the center, and fit closely together along their margins until maturity, when they open and liberate their angled or somewhat winged seeds; cotyledons 2-3.

(*Chamaecyparis* is from the Greek *χαμαι*, on the ground, and *ηνπάμιστος*, cypress.)

240. CHAMAECYPARIS NOOTKATENSIS (LAMB) SPACH.

ALASKA CEDAR, YELLOW CEDAR, SITKA CYPRESS.

Ger., *Gelbe Zeder*; Fr., *Cèdre jaune*; Sp., *Cedro amarillo*.

SPECIFIC CHARACTERS. — *Leaves* about $\frac{1}{2}$ in. long, with rather long rounded points, entire, eglandular or glandular-pitted on the back, dark blue-green, closely appressed and forming a slightly flattened branchlet, the leaves of vigorous shoots sometimes $\frac{1}{2}$ in. long, with sharp points, and on small seedling are from $\frac{1}{4}$ to $\frac{1}{2}$ in. long, acicular, spreading and lighter green. *Flowers*, very early spring, terminating lateral branchlets of the previous season, the staminate on those lower down and the pistillate on the more terminal branchlets; staminate flowers nearly oblong, $\frac{1}{2}$ in. in length, with four or five pairs of stamens; connectives yellow with dark blotch, each bearing two or three pollen sacs; pistillate flowers about $\frac{1}{10}$ in. long; purplish brown with acute spreading scales, each bearing at its base 2-4 ovules. *Fruit* (Sept. and Oct.) a subglobose dark reddish brown cone, maturing the first year, nearly $\frac{1}{2}$ in. in diameter, glaucous, with 4-6 scales each with a prominent pointed boss and frequently resin glands; seeds slightly flattened ovoid, acute, about $\frac{1}{4}$ in. long, dark brown and with wings of lighter shade nearly twice as broad as the seed.

The specific name is from *Nootka*, the name of the sound on the shores of which this tree was discovered by the Scotch naturalist, Archibald Menzies, a little over a century ago.

The Alaska Cedar sometimes attains the height of 100 ft. (30 m.) or more, with narrow pyramidal head of horizontal and geotropic branches and crowded distichous sprays, with a trunk 5 or 6 ft. (1.80 m.) in diameter. It is vested in a grayish or purplish brown bark fissured into wide longitudinal ridges which exfoliate in long thin

* Sargent's *Silva of North America*, X, p. 105.

fibrous strips hanging loosely in abundance about the bases of the trunks.

HABITAT. — From the vicinity of Sitka, Alaska, southward on the islands, and in the coast region of British Columbia and along the Cascade Mountains of Washington and Oregon, as far as Mt. Jefferson. On the islands of Alaska and in British Columbia where it attains its largest dimensions it is found from the sea-level to an altitude of from two to three thousand feet, but in Washington and Oregon it is found only on certain mountains which it ascends to an altitude of four or five thousand feet.

PHYSICAL PROPERTIES. — Wood light but moderately hard and brittle, of exceedingly fine close grain, with a pleasant resinous odor, easily worked and very durable in contact with the soil. It is of a clear light yellowish color with thin lighter colored sap-wood. *Specific Gravity*, 0.4782; *Percentage of Ash*, 0.34; *Relative Approximate Fuel Value*, 0.4766; *Coefficient of Elasticity*, 102881; *Modulus of Rupture*, 801; *Resistance to Longitudinal Pressure*, 455; *Resistance to Indentation*, 101; *Weight of a Cubic Foot in Pounds*, 29.80.

USES. — One of the most valuable of the American timbers, owing to its peculiar qualities as above noted, its great durability, etc.

For cabinet making it has few, if any, equals among our woods, and is likewise most useful for boat building, for furniture, interior finishing of houses, etc. It has been exported to China in considerable quantities where it is used as a substitute for Satin-wood.

The tree is occasionally grown, in both Europe and America, for ornamental purposes, under the name of *Thujaopsis borealis*, and many nursery varieties due to abnormal form, color of foliage, etc., have originated.

NOTE. — Upon examining our specimen sections of this wood one is impressed with its wonderfully slow growth. This tree grew on the slopes of Mt. Hood, and was $18\frac{1}{2}$ in. in diameter inside the bark. A careful count of its annual rings, which could only be made with the aid of a magnifier, revealed the astonishing fact that it was four hundred and twenty-seven years in growing, and yet was perfectly sound to the pith of the center.

241. CHAMAECYPARIS LAWSONIANA (MURR.) PARL.

PORT ORFORD CEDAR. LAWSON CYPRESS. MATCH-WOOD.

Ger., *Cypresse von Lawson*; Fr., *Cypres de Lawson*; Sp., *Cipres de Lawson*.

SPECIFIC CHARACTERS:— *Leaves* about $\frac{1}{8}$ in. long, acute, bright green, conspicuously glandular on the back, closely appressed and forming a flattened branchlet, on leading shoots they are often from $\frac{1}{8}$ to $\frac{1}{4}$ in. long, with points more spreading at apex, and on seedlings they are $\frac{1}{4}$ to $\frac{1}{2}$ in. long, linear-lanceolate and spreading. *Flowers* in very early spring, at the ends of lateral branchlets, the staminate with bright red connectives, bearing usually each 2 or 3 pollen sacs; pistillate flowers darker colored and with more acute and spreading scales. *Fruit* (Sept. to Oct.) globose cones about $\frac{1}{2}$ in. in diameter, usually borne in profusion, reddish brown and often glaucous at maturity, with usually 8-10 rugose scales, with a weak central boss and bearing 2-4 shining brown seeds $\frac{1}{8}$ to $\frac{1}{12}$ in. long, slightly compressed and with thick lateral wings each about as broad as the seed.

The specific name commemorates Sir Chas. Lawson, a distinguished Scottish authority on the coniferous trees, and Lord Provost of Edinburgh.

The Port Orford Cedar occasionally attains the height of 200 ft. (60 m.) with narrow pyramidal head of small horizontal and drooping branches and straight massive trunk sometimes 12 ft. (3.50 m.) in diameter, vested in a very thick dark reddish brown bark divided into wide ridges which exfoliate in thin fibrous strips. It is one of the most beautiful of our cone-bearing trees.

HABITAT. — Few trees of the United States are of as limited distribution it being found growing naturally only in southwestern Oregon, in the vicinity of Coos Bay, and southward to the Klamath river in California, ranging inland a distance of only thirty or forty miles. It flourishes on sandy ridges and the sand dunes of the sea shore, and was early reported to have been found on the southern slopes of Mt. Shasta where, however, it has not been found in recent years.

PHYSICAL PROPERTIES. — Wood light, rather hard and strong, very close grained, easily worked and durable in contact with the soil. It is of a light yellow color with lighter sap-wood, and with a pleasant resinous fragrance. *Specific Gravity*, 0.4621; *Percentage of Ash*, 0.10; *Relative Approximate Fuel Value*, 0.4616; *Coefficient of Elasticity*, 121772; *Modulus of Rupture*, 888; *Resistance to Longitudinal Pressure*, 466; *Resistance to Indentation*, 82; *Weight of a Cubic Foot in Pounds*, 28.80.

USES. — One of the most valuable timber trees of North America in the excellence of its lumber for interior finishing, flooring, boat-building, railway ties, fence posts, etc., and is used extensively in the manufacture of matches. In the last mentioned use its identity is at once asserted by the characteristic fragrance of the smoke of the burning match.

As an ornamental tree it has long been popular in both Europe and America, though generally thriving better in Europe than in the Atlantic states.

MEDICINAL PROPERTIES. — The resin of this wood is a powerful diuretic. This property is so active that workmen in the saw-mills where this lumber is being sawn are so affected, through inhalation, that it becomes necessary to change occasionally to other wood.

GENUS JUNIPERUS, LINNAEUS.

Leaves evergreen, opposite or in whorls of three, rigid and of two forms, one awl-shaped and the other scale like, often both found on the same bush or tree. *Flowers* dioecious, rarely monoeious, in very small catkins. *Sterile catkins* ovate, with shield-shaped scales, each bearing at its base 3-7 anther cells. *Fertile catkins* ovoid or globose, with few (3-5) fleshy, concave, united scales, each bearing one ovule, and these together becoming in *Fruit* a sort of berry, but in reality an altered cone, scaly-bracted underneath, blackish or bluish in color, furnished with a lighter-colored bloom, and containing from 1-3 bony, wingless seeds; cotyledons two.

(*Juniperus* is the classical Latin name of the Juniper.)

242. JUNIPERUS PACHYPHLOEA, TORR.

ALLIGATOR JUNIPER. THICK-BARK JUNIPER. CHECKER-BARK JUNIPER.

Ger., *Dickborke Wachholder*; Fr., *Genévrier à écorce épais*; Sp., *Enebro de corteza espesa*.

SPECIFIC CHARACTERS: — *Leaves* opposite, scarcely $\frac{1}{2}$ in. long, closely appressed, apiculate, slightly denticulate, bluish green and conspicuously white-glandular on the back; leaves on vigorous shoots linear-lanceolate and with longer points; branchlets slender. *Flowers* open in February or March at the tips of branchlets, the staminate in great abundance, oblong, yellow, about $\frac{1}{4}$ in long, with 10 or 12 anther scales; pistillate flowers with more pointed and spreading scales. *Fruit* matures in the autumn of the second season, subglobose, about $\frac{1}{2}$ in. in diameter, often tuberculate, marked with tips of flower scales, bluish the first season and finally brownish, covered with glaucous bloom; seeds four in number, flattened ovoid, pointed, gibbous and ridged on back, thick-walled with large hilum and embryo with two cotyledons.

The specific name, *pachyphloea*, is from Greek roots meaning *thick bark*.

This curious and largest representative of the junipers attains the height of 50 or 60 ft. (18 m.) with trunk 5 or 6 ft. (1.80 m.) in diameter, vested in a strikingly characteristic grayish bark. This is especially curious for a juniper, being more like the barks of certain oaks than of any of the junipers. It is fissured into thick rectangular plates which give an appearance so similar to that of the skin of an alligator, that the name "Alligator" Juniper is aptly applied to it.

The trunk divides usually within 5 or 10 ft. from the ground into a few large branches and a broad rounded top is formed with foliage of a strikingly grayish green color owing to the conspicuous white gland which dots the center of each leaf.

HABITAT. — The mountains of southwestern Texas and westward on

the desert ranges of New Mexico and Arizona south of the Colorado plateau, the lower slopes of mountains of northern Arizona and southward into Mexico. It inhabits dry arid slopes at elevations of from four to six thousand feet within the United States, but attaining its best development in the moist soil of the cañon bottoms to which its sturdy checkered trunks and gray-green foliage impart a peculiar aspect.

PHYSICAL PROPERTIES. — Wood light, soft, brittle, not strong, of very fine grain and susceptible of a very smooth and beautiful polish. It is of an orange-brown color with lighter sap-wood. *Specific Gravity*, 0.5829; *Percentage of Ash*, 0.11; *Relative Approximate Fuel Value*, 0.5823; *Coefficient of Elasticity*, 61275; *Modulus of Rupture*, 761; *Weight of a Cubic Foot in Pounds*, 36.32.

USES. — The wood of this species, though possessed of useful properties, is practically unknown in commerce. The fruit is an article of food with the Indians of the regions in which it grows.

GENUS PINUS, TOURNEFORT.

Leaves evergreen, needle-shaped, from slender buds, in clusters of 2-5 together, each cluster invested at its base with a sheath of thin, membranous scales. *Flowers* appearing in spring, monocious. *Sterile flowers* in catkins, clustered at the base of the shoots of the season; stamens numerous with very short filaments and a scale-like connective; anther cells, 2, opening lengthwise; pollen grains triple. *Fertile flowers* in conical or cylindrical spikes — cones — consisting of imbricated, carpellary scales, each in the axil of a persistent bract and bearing at its base within a pair of inverted ovules. *Fruit* maturing in the autumn of the second year, a cone formed of the imbricated carpellary scales, which are woody, often thickened or awned at the apex, persistent, when ripe dry and spreading each to liberate two nut-like and usually winged seeds; cotyledons 3-12, linear.

(*Pinus* is a Latin word from Celtic *pin* or *pen*, a *crag*.)

243. PINUS FLEXILIS, JAMES.

LIMBER PINE, ROCKY MOUNTAIN WHITE PINE.

Ger., *Biegsame Fichte*; Fr., *Pin souple*; Sp., *Pino flexible*.

SPECIFIC CHARACTERS:—*Leaves* in clusters of 5 each, from $\frac{1}{2}$ -3 in., usually about 2 in., long, with investing sheath of scales very early deciduous, rigid, sharp pointed, entire or nearly so, containing a single fibro-vascular bundle and two dorsal resin ducts; branchlets smooth, slightly pubescent at first, soon becoming of a silvery gray color, flexible and tough. *Flowers* open in June and July, the staminate oval, about $\frac{1}{2}$ in. long, surrounded by 8 or 9 involucre scales and with reddish anthers tipped with short crests; the *pistillate flowers* generally in clusters close to the ends of the branchlets, about $\frac{1}{2}$ in. long, reddish purple, and with short thick peduncles covered with persistent bracts. *Cones* oval or sub-cylindrical, subsessile or with short peduncles, horizontal or slightly declined, 3-5 in. long (except in the variety *macrocarpa*, Engelm., where they are sometimes 10 in. long), light green until mature, with scales thickened toward the apex, those of the lowermost scales strongly reflexed and terminating in a dark rounded umbo. In early autumn the seeds are liberated and the exposed portion of the scales turn to a light brown, the rest dark chocolate; seeds oval, compressed, $\frac{1}{2}$ in. or less in length, their inconspicuous wings being scarcely $\frac{1}{2}$ in. wide and remaining attached to the scales when the seed falls away; cotyledons 6-9.

The specific name, *flexilis*, is the Latin for *pliable*, and refers to the pliable nature of the branchlets.

This pine, though usually a tree of medium stature, 40 or 50 ft. (14 m.) in height, is occasionally nearly twice as tall, and on wind-swept summits is much depressed and contorted. Trees growing in the open occasionally measure 4 or 5 ft. (1.40 m.) in thickness of trunk, and this is covered with a dark brown bark deeply fissured into broad scaly ridges and plates.

HABITAT. — From Alberta southward along the Rocky mountain slopes of western Montana and Idaho and among the mountains generally, at from five to ten thousand feet altitude, to those of western Texas, southern New Mexico and Arizona and southeastern California, and westward to the high western slopes of the Sierra Nevada Mountains in Fresno and Tulare Counties, California. It forms extensive forests on the northern ranges of central Nevada and attains its largest size on the mountains of northern New Mexico and Arizona.

PHYSICAL PROPERTIES. — Wood light, soft, not strong, with numerous small resin passages, easily worked and of an orange-brown color, turning reddish, and nearly white sap-wood. *Specific Gravity*, 0.4358; *Percentage of Ash*, 0.28; *Relative Approximate Fuel Value*, 0.4346; *Coefficient of Elasticity*, 67531; *Modulus of Rupture*, 624; *Resistance to Longitudinal Pressure*, 349; *Resistance to Indentation*, 108; *Weight of a Cubic Foot in Pounds*, 27.16.

USES. — The Rocky Mountain White Pine is manufactured into lumber for general construction purposes, house finishing, etc., in regions where abundant. It is of fair quality and an important timber in regions where few other timber trees abound, especially in central Nevada, northern Arizona and New Mexico.

244. PINUS ALBICAULIS, ENGELM.

WHITE-BARK PINE.

Ger., *Weissborke Fichte*; Fr., *Pin d'écorce blanc*; Sp., *Pino de corteza blanca*.

SPECIFIC CHARACTERS: — *Leaves* in clusters of 5 each, tufted at the ends of the branchlets, $1\frac{1}{2}$ –3 in. long, the sheath (made by the inner bud scales) deciduous, rather thick and rigid, slightly incurved, acute at apex, with entire margin, a single central fibro-vascular bundle, and 2 dorsal and sometimes also a ventral resin duct located near the thick epidermis; branchlets stout, flexible, puberulous, rough and of a rich brown color. *Flowers* open in early summer, the staminate in short spikes, oval, surrounded with an involucre of 8 or 9 bracts; stamens with scarlet crested anthers; pistillate flowers oblong, sessile, erect, in clusters of a few each, bright red and surrounded with chestnut brown bracts. *Cones* stand at about right angles to the branchlet and are mature by the end of August of the second year, from $\frac{1}{2}$ to $3\frac{1}{2}$ in. long, oval or subglobose, sessile, of a purple-brown color, and with scales much thickened towards the tips where both sides are exposed and contracted to a sharp edge, and stout more or less incurved dark tip. The cones mostly fall in the autumn after having liberated their seeds,

which are acute, ovoid, somewhat flattened one side, nearly $\frac{1}{2}$ in. in length with hard thick dark brown coat, and thin wing only about $\frac{1}{2}$ in. wide which remains attached to the scale when the seed falls, cotyledons 7-9.

The specific name, *albicaulis*, is from two Latin words, *albus*, white, and *caulis*, stem, alluding to the white bark.

The White-bark Pine, growing as it does only high up on the mountains, rarely attains a greater height than 50 or 60 ft. (15 m.), though its trunk may attain a diameter of 3 or 4 ft (1 m.). When on exposed ridges it becomes very much depressed and distorted by the winds, and at timber line it may be found as a shrub closely matting to the ground. The bark of trunk is thin, generally from $\frac{1}{4}$ to $\frac{1}{2}$ in. in thickness, of a light brown color or even almost white. Becoming fissured irregularly with age it exfoliates in irregular thin scales and reveals a purplish brown color beneath.

HABITAT. — The high Rocky Mountain slopes of British Columbia from as far north as 53° latitude, southward to northwestern Wyoming, at from five to twelve thousand feet altitude, and generally at the timber line. It is also found on the high mountains of Washington, Oregon, and northern California, the Sierra Nevada and San Bernardino mountains, where it forms the timber line at an altitude of nearly twelve thousand feet.

PHYSICAL PROPERTIES. — Wood light, soft, brittle, easily worked, with many small resin passages, and of a pale brown color with lighter sap-wood. *Specific Gravity*, 0.4165; *Percentage of Ash*, 0.27; *Relative Approximate Fuel Value*, 0.4154; *Coefficient of Elasticity*, 38147; *Modulus of Rupture*, 581; *Resistance to Longitudinal Pressure*, 331; *Resistance to Indentation*, 107; *Weight of a Cubic Foot in Pounds*, 25.96.

USES. — Owing to inaccessibility and inconvenient dimensions of trunk these trees are not often manufactured into lumber or put to other uses. The seeds are said to serve as an article of food for the Indians, and are eagerly eaten by the Clark crow and jays, which make their homes in the high mountains where this tree abounds.

245. PINUS QUADRIFOLIA, PARL.*

PARRY PINE. MEXICAN NUT PINE OR PIÑON.

Ger., Vierblättrige Fichte; Fr., *Pin quadrifeuillier*; Sp., *Pino de quatro hojas*.

SPECIFIC CHARACTERS: — Leaves 1-1 $\frac{1}{2}$ in. long, usually in fascicles of four each (sometimes 3 or 5), with short sheath of reflexed scales at the bases the first season, incurved, with sharp callous tips, entire, pale glaucous green, containing two large dorsal resin ducts, and bearing on the ventral sides 8-10 rows of

* *Pinus Parryana*, Engelm.

stomata. *Staminate flowers* oval, about $\frac{1}{4}$ in. long, and each surrounded by an involucre of four conspicuous pointed bracts; anthers terminating in a lacinated crest; *pistillate flowers* subterminal, solitary or clustered, subglobose, $\frac{1}{4}$ – $\frac{1}{2}$ in. in length, nearly sessile and with obovate short-pointed scales. *Fruit* subglobose cones, from $1\frac{1}{2}$ –2 in. broad, with scales rounded at apex, the exposed portion bright lustrous chestnut brown, conspicuously keeled transversely and with a prominent truncated central knob furnished with a minute recurved tip. The few central scales only bear fertilized seeds and these only develop, those at the base remaining small with recurved bosses and forming a flattened base of the cone; seeds about $\frac{5}{8}$ in. long, elliptical-obovoid, somewhat flattened, dark reddish brown somewhat mottled, with brittle shell and sweet edible kernel; the wings scarcely $\frac{1}{8}$ in. in width and remaining attached to the scale; cotyledons usually eight.

The specific name, *quadrifolia*, Latin for *four-leaved*, alludes to the number of leaves in a fascicle. It is called Parry Pine after the name of its discoverer, Dr. C. C. Parry.

A tree sometimes attaining the height of 30 or 40 ft. (12 m.) with pyramidal top while young, but finally an irregular rounded top. The trunk is short and seldom over 18 in. (0.50 m.) in diameter, clothed in a grayish brown bark which is fissured into prominent longitudinal ridges and exfoliates in small thin scales.

HABITAT. — The center of distribution of the Parry Pine is in lower California, where it forms open forests on the arid slopes and mesas, between three thousand five hundred and seven thousand feet altitude, from near the United States boundary line southward to the foot hills of Mt. San Pedro Martir. It has been found sparingly north of the boundary line, in San Diego Co., California, not far from Campo, and has also been reported from near Julian, and on the desert slopes of the Santa Rosa mountains farther north, in Riverside county.

PHYSICAL PROPERTIES. — Wood light, rather hard, brittle, of very close grain, with numerous conspicuous resin passages, and of a light yellow-brown color with thin lighter sap-wood. *Specific Gravity*, 0.5675; *Percentage of Ash*, 0.54; *Relative Approximate Fuel Value*, 0.5644; *Coefficient of Elasticity*, 37783; *Modulus of Rupture*, 426; *Resistance to Longitudinal Pressure*, 339; *Resistance to Indentation*, 195; *Weight of a Cubic Foot in Pounds*, 35.31.

USES. — The seeds of this species constitute an important article of food with the Indians of lower California, who gather them in large quantities and eat them both raw and roasted.

The trunks are of too small dimensions to be of commercial importance.

246. PINUS BALFOURIANA, MURR.

FOXTAIL PINE. BALFOUR PINE.

Ger., *Fuchsschwanzige Fichte*; Fr., *Pin de queue de renard*; Sp.,
Pino de cola de zorra.

SPECIFIC CHARACTERS: — *Leaves* 1-1½ in. long, in clusters of five each, surrounded at base with a short cup-like sheath, crowded and pressed against the branchlet and persisting for ten or twelve years, stout, rigid, incurved, acute, entire, dark green on dorsal and paler with rows of stomata on the ventral surfaces and bearing single fibro-vascular bundle and two dorsal resin ducts; branchlets at first puberulous and of an orange-brown color become darker with age and long remaining rough with the thick persistent bases of the bud-scales. *Staminate flowers* oval, scarcely ½ in. in length, closely crowded near the extremity of the branchlet and surrounded each by four involucre bracts; anthers reddish orange with irregularly denticulate crest; pistillate flowers subterminal, erect, oblong-ovoid, dark purple, with acutely-pointed scales and borne on stout peduncles from ½-¾ in. in length and covered with light brown ovate acute bracts. *Cones* at maturity pendulous, from 3½-5 in. long and from 1½-1¾ in. wide, subcylindrical, dark purple with long and narrow scales much thickened towards the rounded apex, the exposed portion transversely keeled and furnished with a dark umbo bearing a very small and slender deciduous spine. The seeds are liberated in the autumn of the second year and are about ½ in. in length, somewhat compressed, pointed at base, cream-color dotted with purple, and furnished with a pale membranous wing, about ¾-1 in. in length, oblique at apex and widest at about the center; cotyledons 5.

The specific name, *Balfouriana*, is given in compliment to the Scotch botanist, John Hutton Balfour.

Generally a small or medium-size alpine tree of 30 or 40 ft. (10 m.) or less in height, but in localities most favorable to growth it has been found 90 ft. (27 m.) in height, with trunk 5 ft. (1.50 m.) in diameter. The bark of trunk is rather thick, of a dark red-brown color, deeply fissured into broad ridges and broken into irregular scaly plates. It forms a pyramidal top, symmetrical at first, but finally the lower branches become dependent and the top more or less distorted, but its appearance is always striking on account of its closely appressed, short dark-green needles which persist for ten or fifteen years, and clothe the long, stout branchlets an unusual distance from their tips, giving the tree its descriptive vernacular name.

HABITAT. — A tree of very local distribution, being found only in California, and there only on the high slopes of certain mountains in the northern part of the state, as Mt. Eddy, Scott Mountain (near Mt. Shasta, though strangely it has not been found on Mt. Shasta), on Yolo Bally of the coast range, and then on the southern Sierra Nevada range in the vicinity of Mt. Whitney. It forms belts of open forests, distinguishable at a distance by its dark green foliage, between five and eight thousand feet altitude, in the north immediately below the White-bark Pine and near the timber line. On Mt. Whitney, where it attains its greatest development, it ranges to fifteen thousand feet

altitude, the trees highest up on the mountain being depressed and often shrubby.

PHYSICAL PROPERTIES. — Wood light, soft, brittle, of very close grain, with small resin ducts and of an orange-brown color with lighter sap-wood. *Specific Gravity*, 0.5434; *Percentage of Ash*, 0.40; *Relative Approximate Fuel Value*, 0.5412; *Coefficient of Elasticity*, 59386; *Modulus of Rupture*, 424; *Resistance to Longitudinal Pressure*, 337; *Resistance to Indentation*, 147; *Weight of a Cubic Foot in Pounds*, 33.86.

USES. — Like most other trees of high mountains no particular use is made of this timber, nor does it take well to transplanting for ornamental purposes from its chosen alpine home.

GENUS PICEA, LINK.

Leaves evergreen, scattered (not clustered at the base), sessile, joined upon a persistent base, short ($\frac{1}{2}$ to $\frac{3}{4}$ in.) needle-shaped, 4-angled, pointing every way and all of one kind. *Flowers* appear in spring, monoecious; the *sterile* in the axils of the leaves of the preceding year; anthers tipped with a recurved appendage, cells opening lengthwise; *fertile* flowers in terminal catkins. *Fruit*, cones maturing the first year, pendulous with scales thin (neither thickened nor furnished with a spur at the apex) persistent on the axis. Otherwise quite as described for the genus *Pinus*.

(*Picea* is the ancient Latin name.)

247. PICEA ENGELMANNI, ENGELM.

ENGELMANN SPRUCE. ROCKY MOUNTAIN SPRUCE.

Ger., *Tanne von Engelmann*; Fr., *Sapin d'Engelmann*; Sp., *Abeto de Engelmann*.

SPECIFIC CHARACTERS: — *Leaves* from 1-1 $\frac{1}{2}$ in. in length, tetragonal with acute callous tips, rather flexible, pointing out and forward on all sides of the branchlets, bearing 3-5 rows of stomata on each face but more conspicuously on the upper, glaucous green the first season, but afterwards dark bluish green. *Staminate Flowers* oblong-cylindrical, about $\frac{5}{8}$ in. long, with peduncle about $\frac{1}{4}$ in. long and with dark purple anthers; *pistillate flowers* oblong-cylindrical, red, about $\frac{1}{2}$ to $\frac{3}{4}$ in. in length, with erose or entire scales and small rounded or pointed denticulate bracts. *Cones* usually sessile or nearly so, in abundance on the upper branches, oblong-cylindrical to oval, from 1-3 in. but usually about 2 in. long with very thin lustrous light brown, slightly concave striated scales, which are more or less erose-dentate and generally narrowing to a truncate or pointed apex; seeds about $\frac{1}{12}$ in. long, nearly black with light broad wings about twice their length.

The specific name commemorates the name of the distinguished physician and botanist, Dr. Geo. Engelmann.

This beautiful spruce attains the height of 150 ft. (45 m.) with rather compact and regular symmetrical head and trunk 4 or 5 ft. (1.50 m.) in diameter, vested in a thin bark of purplish brown color which checks irregularly and exfoliates in thin friable scales.

HABITAT. — The Engelmann Spruce is pre-eminently a mountain tree, being found along the slopes of the Rocky Mountains generally

from British Columbia southward to central New Mexico and Arizona and also the Blue and Cascade Mountains of Washington and Oregon nearly to the Californian line. It ranges between the altitudes of two thousand three hundred and five thousand feet in the north to from nine thousand to eleven thousand five hundred feet in the south forming extensive tracts of beautiful and valuable forests on many mountains and said to attain its most stately development north of the United States boundary.

PHYSICAL PROPERTIES. — Wood light, soft, not strong, close grained and yielding a beautiful satiny surface when polished. It is of a pale yellow-brown color, darkest near the center of the log and with slightly lighter colored sap-wood. *Specific Gravity*, 0.3449; *Percentage of Ash*, 0.32; *Relative Approximate Fuel Value*, 0.3438; *Coefficient of Elasticity*, 80791; *Modulus of Rupture*, 574; *Resistance to Longitudinal Pressure*, 267; *Resistance to Indentation*, 76; *Weight of a Cubic Foot in Pounds*, 21.49.

USES. — A valuable timber for general construction purposes, the building of houses, etc. It is also used largely for fuel and charcoal. No doubt when the supply of eastern woods becomes more reduced this species may largely contribute material for sounding boards for musical instruments and pulp for paper-making. The bark is sufficiently rich in tannin to cause its employment in localities for tanning purposes.

GENUS ABIES, LINK.

Leaves sessile, short, solitary, usually more or less flattened and entire, with circular and not prominent bases, often emarginate, more or less two-ranked especially on the horizontal branches and young trees by a twist near the base, bearing stomata usually only below, with two resin ducts; branchlets smooth, bearing the more or less circular not prominent leaf scars. *Flowers* from the axils of last year's leaves; the staminate borne in abundance along the under side of the branchlets, oblong or cylindrical, with short stipes surrounded by numerous bud-scales; anther-cells two, extrorse, opening transversely, the connective terminating in a knob; pollen grains large with two air sacs; pistillate flowers erect, with bracts larger than the scales; ovules two, adnate to the inner side of each scale near the base. *Cones* erect upon the upper branches and maturing the first year, sessile, nearly cylindrical, with numerous spirally arranged, imbricated, carpellary scales, each in the axil of a thin membranous bract which with the scale falls away at maturity from the persistent axis; seed covered with resin-vesicles and each bearing a membranous wing, the base of which covers the outer and laps over upon the inner surface; cotyledons 4 to 10.

Trees of about sixteen or eighteen species, generally of remarkable pyramidal growth, confined to the northern hemisphere of both continents and represented in the United States by nine species mostly on the Pacific Slope. (*Abies* is the ancient Latin name of the Fir.)

248. *ABIES VENUSTA* (DOUGL.) KOCH.*

BRISTLE-CONE FIR. SANTA LUCIA SILVER FIR.

Ger., *Tanne von Santa Lucia*; Fr., *Sapin de Santa Lucia*; Sp.,
Abeto de Santa Lucia.

SPECIFIC CHARACTERS:—*Leaves* linear or linear-lanceolate, from $1\frac{1}{2}$ to nearly $2\frac{1}{2}$ in. long and about $\frac{1}{4}$ in. wide, acuminate, with stiff prickly tips, quite flat, rigid, dark lustrous green and slightly rounded above, silvery white with 8-10 rows of stomata beneath, rather remote, spreading, and two-ranked on the sterile branchlets by a twisting near the bases of the leaves, which when breaking away leave oval scars; resin ducts close to epidermis; buds large, $\frac{1}{2}$ –1 in. long, acute, with thin imbricated scales. *Flowers* open early in May surrounded at the bases with conspicuous involucre formed by the scarious silvery white bud scales; the staminate flowers produced in abundance near the bases of branchlets on the upper half of the tree, cylindrical, averaging about 1 in. in length, with pale yellow but later reddish brown anthers and with slender pedicels; pistillate flowers near the tips of the branchlets of the upper branches only, oblong, about $1\frac{1}{4}$ in. long, with rounded scales nearly as long as the bracts which are yellow-green, obcordate and with long slender awns. *Cones* ovoid-cylindrical, purple-brown, $\frac{3}{4}$ in. long, rounded at apex, having thin scales with incurved denticulate margins and about one-third longer than the bracts which are pale yellowish brown, linear, obcordate, with rigid long foliaceous midribs exerted, from 1 to nearly 2 in. in length; seeds dark brown, about $\frac{3}{8}$ in. long, with oblong-obovate lustrous wing about $\frac{1}{2}$ in. long.

This singular fir rarely attains a greater height than 100 ft. (33 m.) or greater diameter of trunk than 3 ft. (0.90 m.) This is covered with a reddish-brown bark broken into irregular closely appressed scales on which persist for a time the resin-blisters of the younger bark. Its habit of growth easily distinguishes it from other firs, as its top is of slender spire-shape above and swells out abruptly below into a wide base of longer horizontal and drooping branches. Its lateral branchlets are remote, and being sparsely clothed with long leaves, dark green above and silvery white beneath, the tree is readily distinguished from all its neighbors, and pronounced one of singular habit of growth.

HABITAT. — Few known trees have as limited an area of distribution, being found only among the rugged fastnesses of the Santa Lucia mountains, in the western part of Monterey Co., California, and there was long supposed to be confined to the moist soil of the bottoms of only a few cañons. The recent explorations of Prof. W. R. Dudley, however, have added much to our knowledge on this point. He has found the tree in considerable abundance to the northward of the previously known range, and now designates its region of distribution as being an area of about fifty miles in north and south direction, and from near the coast inland at least eighteen miles, and that its vertical range is between the altitudes of fifteen hundred and five thousand feet.

* *A. bracteata*, Nutt.

He has found that its favorite home proves to be "on crag, rocky ridge and slope, although it is also found in cañons and along streams," and that it is not on the fog-bathed ridge of the coast mountains nearest the sea, but the ridges next within, which have abundant precipitation, but are semi-arid in summer.

PHYSICAL PROPERTIES. — The wood of this species is rather light and hard, coarse grained, with numerous very fine medullary rays, and of a pale yellow-brown color with little distinction in tint between heart and sap-wood. *Specific Gravity*, 0.6783; *Percentage of Ash*, 2.04; *Relative Approximate Fuel Value*, 0.6645; *Weight of a Cubic Foot in Pounds*, 42.27.

USES. — Although a wood of valuable properties it has never been considered of commercial importance, owing to its inaccessibility and the sparseness of the population in the regions in which it grows. It is worthy of recognition for ornamental planting, and is successfully grown in the milder parts of Great Britain and Europe, though apparently not adapted to the climate of eastern United States.

249. ABIES AMABILIS, FORB.

AMABILIS FIR. RED SILVER FIR.

Ger., *Holdselige Tanne*; Fr., *Sapin aimable*; Sp., *Abeto amable*.

SPECIFIC CHARACTERS: — *Leaves* flat, deeply grooved and lustrous dark green above, silvery white with broad bands of stomata and midrib prominent beneath, on sterile branches, from $\frac{3}{4}$ –1 $\frac{1}{4}$ in. long, generally obtuse or rounded and notched at apex, erect and very crowded, those on the upper side of the branchlet much shorter than those of the sides; on fertile branchlets $\frac{1}{2}$ – $\frac{3}{4}$ in. long, acute, with callous tips; winter buds nearly globose with closely imbricated scales and thickly coated with resin; branchlets stout, finely pubescent and of a reddish brown color. *Staminate flowers* oblong, $\frac{1}{2}$ – $\frac{3}{4}$ in. long, with slender pedicel nearly $\frac{1}{4}$ in. long, anthers red; *pistillate flowers* oblong-cylindrical, nearly or quite 1 in. long and $\frac{1}{8}$ in. thick, purple and with lustrous pointed exserted bracts. *Cones* oblong, from $3\frac{1}{2}$ to nearly 6 in. in length and from 2–2 $\frac{1}{2}$ in. thick, rounded or retuse at apex, purple, puberulous, scales 1 in. or slightly more wide at their rounded apex and nearly as long; bracts wholly included, reddish, about half as long as scales, obovate with slender pointed tip; seeds yellowish brown, $\frac{1}{2}$ in. long with oblique, cuneate pale brown wings $\frac{3}{4}$ in. long and nearly as broad.

The specific name, *amabilis*, is the Latin for *lovely*, and alludes to the impressive beauty of the tree.

This handsome fir sometimes attains the height of 250 ft. (75 m.) under most favorable circumstances, with a trunk 5 or 6 ft. (1.75 m.) in diameter. The bark when young is thin, smooth, grayish white, beset with copious resin blisters, and when older becomes checked irregularly into broad scaly ridges. It develops a rather open pyramidal top with gracefully curving lower branches and wide sprays of drooping branchlets. It is one of the most beautiful of our evergreen trees and is especially so when bearing its large erect purple cones.

HABITAT. — From the mountains of southern British Columbia southward along both slopes of the Cascade Mountains and the coast ranges of Washington and Oregon at elevations of from about twelve hundred to six thousand feet, probably attaining its greatest size on the Olympic Mountains, and reaching its southern most limit of distribution about a hundred miles north of the southern boundary of Oregon.

PHYSICAL PROPERTIES. — Wood light, of medium hardness and strength, close grained and of a pale brownish red color with little difference in tint between sap and heart-woods. *Specific Gravity*, 0.4228; *Percentage of Ash*, 0.23; *Relative Approximate Fuel Value*, 0.4218; *Coefficient of Elasticity*, 126013; *Modulus of Rupture*, 792; *Resistance to Longitudinal Pressure*, 467; *Resistance to Indentation*, 64; *Weight of a Cubic Foot in Pounds*, 26.35.

USES. — Though not extensively employed, probably from the abundance of other woods, this wood is used occasionally for interior finishing and general construction purposes.

GENUS LARIX, TOURN.

Leaves needle-shaped, soft, deciduous, in clusters of many each, from lateral scaly buds excepting along the shoots of the season, where they are scattered. *Sterile flowers* terminating lateral scaly buds or spurs on shoots of preceding year, with 2-celled anthers opening longitudinally; pollen grains, simple and globular. *Fertile flowers* in catkins — cones — red while in flower, consisting of several or many carpellary scales springing from the axils of bracts, and bearing each 2 ovules with orifices turned downward. *Fruit* an erect, oval or roundish cone, with colored persistent scales, and maturing the season of blossoming.

(*Larix* is the Latin classical name of the Larch.)

A genus of eight species of trees (three of which are American), confined to the boreal and mountainous regions of the northern hemisphere and of great economic importance. (*Larix* is the ancient Latin name of the Larch.)

250. LARIX OCCIDENTALIS, NUTT.

WESTERN TAMARACK. LARCH OR HACKMATACK.

Ger., *Westliche Lärche*; Fr., *Meleze occidentale*; Sp., *Larice occidental*.

SPECIFIC CHARACTERS: — *Leaves* from 1-1 $\frac{3}{4}$ in. long, triangular, rigid, rounded above, keeled beneath, with sharp point and of a pale green color; branchlets pubescent at first but soon glabrous; winter buds subglobose. *Staminate flowers* oblong, on stalks finally about $\frac{1}{2}$ in. long; anthers pale yellow; *pistillate flowers* oblong, subsessile with nearly orbicular scales and bracts with midrib prolonged in a long slender tip. *Cones* from 1-1 $\frac{1}{2}$ in. in length, nearly sessile with numerous thin stiff scales which are entire or nearly so, hoary-tomentose beneath below the middle and widely separating or becoming reflexed at maturity to liberate the seeds, which are pale brown, nearly $\frac{1}{4}$ in. long, and furnished with a thin pale wing two or three times their length, broadest at about the middle and obliquely rounded at apex.

This beautiful Larch is the most stately of its genus, attaining under favorable circumstances a height of 250 ft. (75 m.) with columnar

trunk sometimes 6 or 8 ft. (2 m.) in diameter. It develops an open pyramidal top of light green airy foliage, which in old forest grown trees seems remarkably scant for the size of the trunk. The bark of the younger trunks is thin, of a reddish brown color, and exfoliating in thin irregular scales, while that of the older trunks is thick and fissured into large scaly plates.

HABITAT. — The Western Tamarack is confined entirely to the basin of the upper Columbia River, being most abundant and attaining its greatest dimensions on the bottom lands of northern Montana and Idaho. It ranges between the altitudes of two thousand and seven thousand feet, from the western slopes of the continental divide in northern Montana to the eastern slopes of the Cascade Mountains of Washington and Oregon, as far south as Mt. Jefferson in Oregon, and northward into southern British Columbia, to the head waters of the Thompson River in about latitude 57° north. It is not entirely confined to bottom lands, being found in abundance on dry slopes and benches, though less developed than in the moist soil of the bottom lands.

PHYSICAL PROPERTIES. — Wood heavy, hard, strong, close grained, with few resin passages, very durable in contact with the soil, and susceptible of a very smooth polish. It is of a rich orange-brown color with thin brownish-white sap-wood. *Specific Gravity*, 0.7407; *Percentage of Ash*, 0.09; *Relative Approximate Fuel Value*, 0.7400; *Coefficient of Elasticity*, 165810; *Modulus of Rupture*, 1227; *Resistance to Longitudinal Pressure*, 689; *Resistance to Indentation*, 139; *Weight of a Cubic Foot in Pounds*, 46.16.

USES. — One of the most valuable of the coniferous trees of the continent. The Western Larch produces hard and durable lumber of excellent quality for the manufacture of furniture, doors, interior finishing, etc. It is also highly valued for railway ties, fence posts, etc. A sweetish substance, resembling dextrin in properties, exudes in abundance from wounds in the trunk of this tree, and is gathered and eaten by the Indians.

INDEX.

	No.	Page.		No.	Page.
Abedul occidental.....	236	34	Cypress, Arizona.....	239	38
Abeto amable.....	249	51	Lawson	241	41
de Engelmann	247	48	Sitka.....	240	39
de Santa Lucia.....	248	50	Eiche von Emory	234	32
<i>Abies amabilis</i>	249	51	Weissblätterige	235	33
<i>bracteata</i>	248	50	Elder, Mexican	229	25
<i>venusta</i>	248	50	Elm, California Slippery	226	20
<i>Acacia mollissima</i>	227	22	Enebro de corteza espesa	242	42
Acacia d'argent	227	22	Erdbeerbaum, Arizonischer... ..	230	26
plateada.....	227	22	ERICACEÆ	26	26
Acacie, Silberige	227	22	Esche, Fransenblühende.....	231	28
ANGIOSPERMÆ	20	20	Fichte, Biegsame.	243	43
Arbousier d'Arizona	230	26	Fuchsschwanzige	246	47
<i>Arbutus Arizonica</i>	230	26	Vierblätterige	245	45
Ash, Fringe-flower	231	28	Weissborke.....	244	44
BETULACEÆ	34	34	Fir, Amabilis	249	51
<i>Betula occidentalis</i>	236	34	Bristle-cone	248	50
Birch, Puget Sound	236	34	Red Silver.....	249	51
Western.....	236	34	Santa Lucia Silver.....	248	50
Birch Family	34	34	<i>Fraxinus dipetala</i>	231	28
Birke, Westliche	236	34	Fremontia	226	20
Bouleau occidental.....	236	34	<i>Fremontodendron Californi-</i>		
CACTACEÆ	22	22	<i>cum</i>	226	20
Cactus Giant.....	228	23	Frêne à fleurs de frange	231	28
gigantesque.....	228	23	Fresno de flores de franja	231	28
Cactus Family	22	22	Genévrier à écorse épais.....	242	42
CAPRIFOLIACEÆ	24	24	GYMNOSPERMÆ	37	37
Cedar, Alaska	240	39	Hackmatack	250	52
Port Orford.....	241	41	Heath Family.....	26	26
Yellow	240	39	Holunder, Mexicanischer.	229	25
Cèdre jaune.....	240	39	Honeysuckle Family	24	24
Cedro a narillo	240	39	JUGLANDACEÆ	30	30
<i>Cereus giganteus</i>	228	23	<i>Juglans rupestris</i>	223	30
<i>Chimæcyparis Lawsoniana</i> ...	241	41	Juniper, Alligator.....	242	42
<i>Nootkatensis</i>	240	39	Checker-bark	242	42
CHEIRANTHODENDREÆ.....	20	20	Thick-bark	242	42
Chêne à feuilles blanches....	235	33	<i>Juniperus pachyphloea</i>	242	42
d'Emory	234	32	Key based upon Fruit	9	9
Cipres de Arizona.....	239	38	Leaves.....	1	1
de Lawson.....	241	41	Larch	250	52
CONIFERÆ	37	37	Lärche, Westliche	250	52
<i>Cupressus Arizonica</i>	239	38	Larice occidental	250	52
CUPULIFERÆ.....	31	31			
Cypresse, Arizonische.....	239	38			
von Lawson	241	41			
Cypres d'Arizona	239	38			
de Lawson.....	241	41			

	No.	Page.		No.	Page.
<i>Larix occidentalis</i>	250	52	<i>Quercus Emoryi</i>	234	32
LEGUMINOSÆ	21		<i>hypoleuca</i>	235	33
Madroña, Arizona.....	230	26	Riesencactus	228	23
de Arizona	230	26	Roble de Emory.....	234	32
Match-wood	241	41	de hojas blancas	235	33
Meleze occidentale	250	52	Saguaro	228	23
Nogal de Arizona	233	30	SALICACEÆ	35	
Noyer d'Arizona	233	30	<i>Salix lasiandra</i>	237	35
Oak, Arizona Black.....	234	32	<i>Sitchensis</i>	238	36
Emory	234	32	<i>Sambucus Canadensis</i> , var.		
White-leaf	235	33	<i>Mexicana</i>	229	25
Oak Family.....	31		<i>Sambucus Mexicana</i>	229	25
OLEACEÆ	27		Sapin aimable	249	51
Olive Family	27		d'Engelmann	247	48
<i>Picea Engelmanni</i>	247	48	de Santa Lucia	248	50
Pin d'ecorce blanc.....	244	41	Sauco de Mexico	229	25
de queue de renard	246	47	Sauce de Sitka	238	36
quadrifeuillier	245	45	negro occidental.....	237	35
souple	243	43	Saule de Sitka	238	36
Pine, Balfour	246	47	noir occidental.....	237	35
Foxtail	246	47	Schwarzweide, Westliche	237	35
Limber	243	43	Spruce, Engelmann	247	48
Mexican Nut.....	245	45	Rocky Mountain	247	48
Parry.....	245	45	Sureau de Mexico	229	25
Rocky Mountain White,	243	43	Suwarro	228	23
White-bark	244	44	Sycamore, Arizona.....	232	29
Pine Family.....	37		Tamarack, Western.....	250	52
Pino de cola de zorra.....	246	47	Tanne, Holdselige.....	249	51
de corteza blanca	244	44	von Engelmann	247	48
de quatro hojas	245	45	von Santa Lucia	248	50
flexible	243	43	Wachholder, Dickborke.....	242	42
Piñon, Mexican	245	45	Wallnuszbaum, Arizonischer..	233	30
<i>Pinus albicaulis</i>	244	44	Walnut, Arizona	233	30
<i>Balfouriana</i>	246	47	Mexican	233	30
<i>flexilis</i>	243	43	Walnut Family	30	
<i>Parryana</i>	245	45	Wattle, Black.....	227	22
<i>quadrifolia</i>	245	45	Silver	227	22
Plane-tree Family.....	28		Weide von Sitka	238	36
PLATANACEÆ	28		Willow, Silky	238	36
Platane, Arizonische	232	29	Sitka	238	36
d'Arizona	232	29	Western Black	237	35
Platano de Arizona.....	232	29	Willow Family.....	35	
<i>Platanus Wrightii</i>	232	29	Zeder, Gelbe	240	39
Pulse Family	21				

GENERAL INDEX

TO TECHNICAL AND ENGLISH NAMES.

AMERICAN WOODS, PARTS I-X.

Technical names are in italics and important synonyms in parentheses.

	Part.	No.		Part.	No.
<i>Abies amabilis</i>	X	249	Bay, Bull.....	V	101
<i>balsamea</i>	I	22	California Rose.....	VII	158
<i>concolor</i>	VII	173	Loblolly or Tan.	V	102
<i>grandis</i>	IX	224	Swamp Red.....	V	113
<i>magnifica</i>	VII	174	Sweet.....	III	51
<i>nobilis</i>	IX	225	Bayberry.....	VII	164
<i>venusta (bracteata)</i>	X	248	Bay Tree.....	VII	159
Acacia, Green-bark.....	VI	128	Bearberry.....	VI	126
<i>Acacia decurrens</i>	IX	206	Beech.....	I	16
<i>melanoxydon</i>	VII	155	Blue.....	II	42
<i>mollissima</i>	X	227	<i>Betula lenta</i>	II	44
<i>Acer circinatum</i>	IX	203	<i>lutea</i>	I	17
<i>dasycarpum (sacchari-</i>			<i>nigra</i>	IV	95
<i>num, L.)</i>	II	26	<i>occidentalis</i>	X	236
<i>macrophyllum</i>	VII	152	<i>papyracea (papyri-</i>		
<i>Negundo</i>	III	54	<i>fera)</i>	II	43
<i>Pennsylvanicum</i>	IV	79	<i>populifolia</i>	III	70
<i>rubrum</i>	III	53	Big or Giant-tree, California..	VI	142
<i>saccharinum Wang (sac-</i>			Birch, Black, Cherry or Sweet	II	44
<i>charum Marsh)</i>	I	7	Paper or Canoe.....	II	43
<i>Æsculus Californica</i>	VI	127	Poplar-leaf or Gray....	III	70
<i>Hippocastanum</i>	I	6	Red or River.....	IV	95
Ailanthus, Tree of Heaven...	I	4	Western.....	X	236
<i>Ailanthus glandulosus</i>	I	4	White.....	II 43	III 70
Alder, California or White. .	VII	163	Yellow.....	I	17
Oregon or Red.....	IX	217	Black-wood.....	VII	155
<i>Alnus Oregona</i>	IX	217	Blue Beech, Hornbeam.....	II	42
<i>rhombifolia</i>	VII	163	Blue-blossom, Northern.....	VII	151
<i>Amelanchier Canadensis</i>	III	59	Southern.....	IX	202
Angelica-tree.....	I	8	Box-elder..	III	54
Apple.....	II	30	Boxwood.....	IV	88
Custard.....	IV	76	Buckeye, California.....	VI	127
<i>Aralia spinosa</i>	I	8	Buckthorn, Island.....	VIII	176
Arbor-Vitæ, Eastern.....	I	24	Sacred-bark.....	VI	126
Pacific.....	IX	220	Butternut or Oilnut.....	I	14
<i>Arbutus Arizona</i>	X	230	Button-ball Tree, Buttonwood	I	13
<i>Menziesii</i>	VI	132	Cactus, Mission, Indian Fig..	VIII	184
<i>Arctostaphylos pungens</i>	VI	133	Giant.....	X	228
Ash, Black or Hoop.....	III	62	<i>Carpinus Carolinæana</i>	II	42
Fring-flower.....	X	231	Cascara Sagrada.....	VI	126
Leather-leaf.....	IX	212	<i>Castanea vesca (dentata)</i>	II	40
Oregon.....	VIII	187	<i>Castanopsis chrysophylla</i>	VI	139
Red.....	II	31	Castor-bean Tree.....	VIII	189
White.....	I	10	<i>Carya alba (Hicoria ovata)</i> ...	II	36
Ash Burl.....	III	62a	<i>aquatica (H. aquatica)</i>	V	115
<i>Asimina triloba</i>	IV	76	<i>microcarpa (H. odorata)</i>	IV	91
Asp or Aspen, Quaking.....	III	72	<i>porcina (H. glabra)</i>	III	65
Large-tooth.....	I	18	<i>sulcata (H. laciniata)</i> ...	III	64
Balsam Fir.....	I	22	<i>tomentosa (H. alba)</i>	IV	90
Basswood.....	I	3	<i>Catalpa bignonioides (catalpa)</i>	IV	89

	Part.	No.		Part.	No.
<i>Ceanothus arboreus</i>	III	177	<i>Dalea</i>	VII	154
<i>sorediatus</i>	IX	202	<i>Dalea spinosa</i>	VII	154
<i>spinosus</i>	IX	201	Devil-wood.....	V	112
<i>thyrsiflorus</i>	VII	151	<i>Diospyros Virginiana</i>	III	61
Cedar, Alaska.....	X	240	Dogwood, Alternate-leaf.....	IV	87
Giant or Northwestern			Flowering.....	IV	88
Red.....	IX	220	Western Flowering	VIII	185
Incense or Cal. White..	VI	141			
Port Orford.....	X	241	Elder, Pale.....	VII	157
Red or Pencil.....	I	25	Mexican.....	X	229
White..... I, 24	III	74	Elm, American or White. ...	II	33
Yellow..... VII, 168	X	240	Cork or Cork-bark.....	II	34
<i>Celtis occidentalis</i>	I	12	Slippery or Red.....	I	11
<i>Cercidium Torreyanum</i>	VI	128	“Elm,” California Slippery ..	X	226
<i>Cercocarpus parvifolius</i>	VI	130	<i>Eucalyptus globulus</i>	VIII	183
<i>Cereus giganteus</i>	X	228	<i>rostrata</i>	IX	211
<i>Chamaecyparis Lawsoniana</i> ..	X	241			
<i>Nootkatensis</i> ..	X	240	<i>Fagus ferruginea</i> (American,		
<i>thyoides</i> ..	III	74	or <i>atropinacea</i>).....	I	16
Cherry, Bird, Pigeon or Pin..	III	55	Fir, <i>Amabilis</i> or Red Silver...	X	249
Black.....	II	29	Balsam.....	I	22
Holly-leaf.....	VII	156	Bristle-cone (or Sta. Lucia)	X	248
Ox-heart or Sweet...	III	55	California Red.....	VII	174
Sour.....	IV	82	Great Silver.....	IX	224
Woolly-leaf Bitter ...	IX	208	Noble.....	IX	225
Chestnut.....	II	40	Oregon.....	VI	150
Evergreen.....	VI	139	White Silver.....	VII	173
<i>Chilopsis saligna</i> (<i>linearis</i>)...	VI	134	<i>Forestiera acuminata</i>	V	111
China-berry.....	V	105	<i>Fraxinus Americana</i>	I	10
Chinquapin, California.....	VI	139	<i>dipetala</i>	X	231
Christmas-berry.....	VIII	181	<i>Oregona</i>	VIII	187
<i>Citrus Aurantium</i>	V	103	<i>pubescens</i> (<i>Pennsyl-</i>		
<i>Limonum</i>	V	104	<i>vanica</i>).....	II	31
<i>Cliftonia ligustrina</i> (<i>mono-</i>			<i>sambucifolia</i> (<i>niagra</i>).	III	62
<i>phylla</i>).....	V	108	<i>velutina</i>	IX	212
Coffee-tree.....	II	27	Fremontia.....	X	226
<i>Cornus alternifolia</i>	IV	87	<i>Fremontodendron Californi-</i>		
<i>florida</i>	IV	88	<i>cum</i>	X	226
<i>Nuttallii</i>	VIII	185			
Cottonwood, Black.....	IX	218	<i>Garrya elliptica</i>	VI	131
Common.....	II	48	<i>Gleditschia</i> (<i>Gleditsia</i>) <i>monos-</i>		
River.....	IV	97	<i>perma</i> (<i>aquatica</i>).....	V	109
White, or Fre-			<i>triacanthos</i>	II	28
mont.....	VIII	194	Grape, Summer.....	IV	78
Crab or Crab-apple, Oregon...	IX	209	Grease-wood.....	VII	164
Sweet-scented.....	IV	83	Grevillea, Silky “Oak”.....	IX	213
<i>Crataegus coccinea</i>	IV	86	<i>Grevillea robusta</i>	IX	213
<i>Crus-galli</i>	IV	85	<i>Gordonia lasianthus</i>	V	102
<i>Douglasii</i>	IX	210	Gum, Blue.....	VIII	183
<i>punctata</i>	III	58	Red.....	III, 60	IX 211
Cucumber-tree.....	I	1	Sour.....	I	9
<i>Cupressus Arizona</i>	X	239	Sweet.....	III	60
<i>Goveniana</i>	VII	166	<i>Gymnocladus Canadensis</i>		
<i>Macnabiana</i> ..	IX	219	(<i>dioicus</i>).....	II	27
<i>macrocarpa</i>	VIII	195			
Cypress, Arizona.....	X	239	Hackberry, Sugarberry.....	I	12
Bald.....	V	119	Hemlock, Alpine.....	VII	171
Gowen.....	VII	166	Eastern.....	I	21
Lawson.....	X	241	Western.....	IX	223
MacNab.....	IX	219	Hercules' Club.....	I	8
Monterey.....	VIII	195	<i>Heteromeles arbutifolia</i>	VIII	181
Sitka.....	X	240			
<i>Cyrilla racemiflora</i>	V	107			

	Part.	No.		Part.	No.
Hickory, Big Shell-bark.....	III	64	<i>Magnolia acuminata</i>	I	1
Bitternut.....	II	37	<i>glauca</i>	III	51
Mokernut.....	IV	90	<i>grandiflora (foetida)</i>	V	101
Pig-nut.....	III	65	Magnolia, Evergreen.....	V	101
Shag-bark.....	II	36	Small.....	III	51
Small-fruited.....	IV	91	Mahogany, Mountain.....	VI	130
Water.....	V	115	Manzanita, Common.....	VI	133
Holly, American.....	III	52	Maple, Ash-leaf.....	III	54
California.....	VIII	181	Big-leaf.....	VII	152
Honey Locust.....	II	28	Birds-eye.....	I	7b
Honey-pod.....	VI	129	Blister.....	I	7a
Hop-free, Wafer "Ash".....	IV	77	Curly.....	II	26a
Hornbeam, Hop.....	II	42	Red.....	III	53
Horse Bean, Small-leaf.....	IX	204	Silver or White.....	II	26
Horse Chestnut.....	I	6	Soft.....	II 26	III 53
			Striped, Moosewood ..	IV	79
<i>Ilex opaca</i>	III	52	Sugar or Hard..	I	7
Indigo Bush.....	VII	154	Vine ..	IX	203
Iron-wood, Eastern.....	II	41	<i>Melia Azedarach</i>	V	105
Santa Catalina....	VIII	182	Mesquite.....	VI	129
Southern ..	V	107	Screw-pod ..	IX	205
Islay.....	VII	156	<i>Morus rubra</i>	III	63
Joshua Tree.....	VII	175	Mountain Ash, Elder-leaf...	IV	84
<i>Juglans Californica</i>	VIII	190	Mulberry, Red.....	III	63
<i>cinerea</i>	I	14	<i>Myrica Californica</i>	VII	164
<i>nigra</i>	II	35	Myrtle, California Wax.....	VII	164
<i>rupestris</i>	X	233	Dark-leaf.....	IX	202
June-berry.....	III	59	Redwood.....	IX	201
Juniper, Alligator, Thick-bark	X	242	Tree.....	VIII	177
California.....	VII	167	Nettle-tree.....	I	12
Western.....	VII	168	<i>Nicotiana glauca</i>	VIII	188
<i>Juniperus Californica</i>	VII	167	<i>Nyssa multiflora (sylvatica)</i> ...	I	9
<i>occidentalis</i>	VII	168	Ogeche.....	V	110
<i>pachyphloea</i>	X	242			
<i>Virginiana</i>	I	25	Oak, Arizona Black.....	X	234
King-nut Hickory.....	III	64	Basket or Cow.....	V	116
Larch, Eastern.....	I	23	Blue.....	IX	214
Western.....	X	250	Burr or Mossy-cup...	II	39
"Larch," Oregon.....	IX, 225	X 249	Cal. Black or Kellogg...	VII	162
<i>Larix Americana (laricina)</i> ..	I	23	California Coast Live....	VI	137
<i>occidentalis</i>	X	250	California White, Valley		
Laurel, Big.....	V	101	or Weeping.....	VII	160
California.....	VII	159	Cañon or Thick-cup Live	VII	161
Swamp..	III	51	Chestnut or Rock.....	III	67
Lemon.....	V	104	Chinquapin.....	III	68
Lemonade Tree.....	VII	153	Eastern Live.....	V	117
<i>Libocedrus decurrens</i>	VI	141	Emory.....	X	234
Lilac, California Wild.....	VII	151	Engelmann.....	IX	215
Lime, Ogechee, Gopher Plum.	V	110	Highland Live..	VIII	192
Lin or Linden, American....	I	3	Island Live.....	VIII	191
<i>Liriodendron Tulipifera</i> ..	I	2	MacDonald.....	IX	216
Liquidamber, Bilsted.....	III	60	Mountain White or Ore-		
<i>Liquidambar Styraciflua</i>	III	60	gon.....	VI	136
Locust.....	IV	80	Pin.....	IV	94
Honey.....	II	28	Post.....	IV	92
Water.....	V	109	Red.....	I	15
<i>Lyonothamnus floribundus</i> ..	VIII	182	Santa Catalina White...	VIII	191
Madroña, California.....	VI	132	Scarlet.....	III	69
Arizona.....	X	230	Swamp White.....	III	66
			Tan-bark.....	VI	138
			Water ..	V	118

	Part.	No.		Part.	No.
Oak, White.....	II	38	<i>Pinus flexilis</i>	X	243
White-leaf.....	X	235	<i>glabra</i>	V	123
Yellow or Black.....	IV	93	<i>inops</i> (Virginiana).....	IV	98
<i>Olea Europea</i>	VIII	186	<i>Lambertiana</i>	VI	146
Olive.....	VIII	186	<i>mitis</i> (echinata).....	III	75
Wild.....	V	112	<i>monophylla</i>	VIII	196
<i>Opuntia Tuna</i>	VIII	184	<i>monticola</i>	IX	221
Orange.....	V	103	<i>muricata</i>	VII	170
<i>Osmanthus Americanus</i>	V	112	<i>palustris</i>	V	124
<i>Ostrya Virginica</i>	II	41	<i>quadrifolia</i> (Parryana).....	X	245
			<i>ponderosa</i>	VI	147
Palm, California Fan.....	VIII	200	<i>radiata</i>	VIII	189
Palo Verde.....	VI	128	<i>resinosa</i>	I	19
Mountain.....	IX	204	<i>rigida</i>	II	50
Papaw.....	IV	76	<i>Sabina</i>	VIII	198
<i>Parkinsonia microphylla</i>	IX	204	<i>serotina</i>	V	121
Pear.....	III	57	<i>strobilus</i>	II	49
Prickly.....	VIII	184	<i>Torreyana</i>	VIII	197
Pepperidge.....	I	9	Planer-tree.....	V	114
Pepper-wood.....	V, 106	VII 159	<i>Planera aquatica</i>	V	114
<i>Persea palustris</i> (pubescens).....	V	113	<i>Platanus occidentalis</i>	I	13
Persimmon.....	III	61	<i>racemosa</i>	VI	135
<i>Picea alba</i> (Canadensis).....	IV	100	<i>Wrightii</i>	X	232
<i>Engelmanni</i>	X	247	Plum, Canada.....	IV	81
<i>nigra</i> (mariana).....	I	20	Pacific.....	IX	207
<i>Sitchensis</i>	VI	149	Poplar, Balsam, Tacamahac.....	II	47
Pine, Bastard.....	V	125	Large-tooth.....	I	18
Bull, Western Yellow.....	VI	147	Lombardy.....	III	73
California Scrub.....	VI	148	Necklace.....	II	48
California Swamp, Obispo or Prickle-cone.....	VII	170	Swamp or Downy.....	IV	97
Coulter, Big-cone.....	VII	169	Trembling.....	III	72
Digger, Gray-leaf.....	VIII	198	White.....	IV	96
Fox-tail.....	X	246	<i>Populus alba</i>	IV	96
Georgia, Long-leaf.....	V	124	<i>balsamifera</i>	II	47
Gray, Northern Scrub.....	IV	99	<i>dilatata</i>	III	73
Jersey, Scrub.....	IV	98	<i>Fremontii</i>	VIII	194
Knob-cone.....	IX	222	<i>grandidentata</i>	I	18
Limber.....	X	243	<i>heterophylla</i>	IV	97
Lowland Spruce.....	V	123	<i>monilifera</i> (deltoides).....	II	48
Monterey.....	VIII	199	<i>tremuloides</i>	III	72
Mountain White.....	IX	221	<i>trichocarpa</i>	IX	218
Parry, Mexican Nut.....	X	245	Prickly Ash, Sea Ash.....	V	106
Pitch.....	II	50	Pride of India.....	V	105
Pond.....	V	121	Privet, Swamp.....	V	111
Red, "Norway".....	I	19	<i>Prosopis juliflora</i>	VI	129
Sand.....	V	122	<i>odorata</i> (pubescens).....	IX	205
Short-leaf, Yellow.....	III	75	<i>Prunus Arbutum</i>	III	55
Single-leaf Piñon.....	VIII	196	<i>Cerasus</i>	IV	82
Slash.....	V	125	<i>ilicifolia</i>	VII	156
Sugar.....	VI	146	<i>mollis</i>	IX	208
Torrey, Del Mar.....	VIII	197	<i>nigra</i>	IV	81
White-bark.....	X	244	<i>Pennsylvanica</i>	III	55
White.....	II	49	<i>serotina</i>	II	29
Oregon.....	VI	150	<i>subcordata</i>	IX	207
<i>Pinus albicanis</i>	X	244	<i>Pseudotsuga macrocarpa</i>	VII	172
<i>attenuata</i>	IX	222	<i>taxifolia</i>	VI	150
<i>Balfouriana</i>	X	246	<i>Ptelea trifoliata</i>	IV	77
<i>Banksiana</i> (divaricata).....	IV	99	<i>Pyrus communis</i>	III	57
<i>clausa</i>	V	122	<i>coronaria</i>	IV	83
<i>contorta</i>	VI	148	<i>Malus</i>	II	30
<i>Coulteri</i>	VII	169	<i>rivularis</i>	IX	209
<i>Cubensis</i> (heterophylla).....	V	125	<i>sambucifolia</i>	IV	84

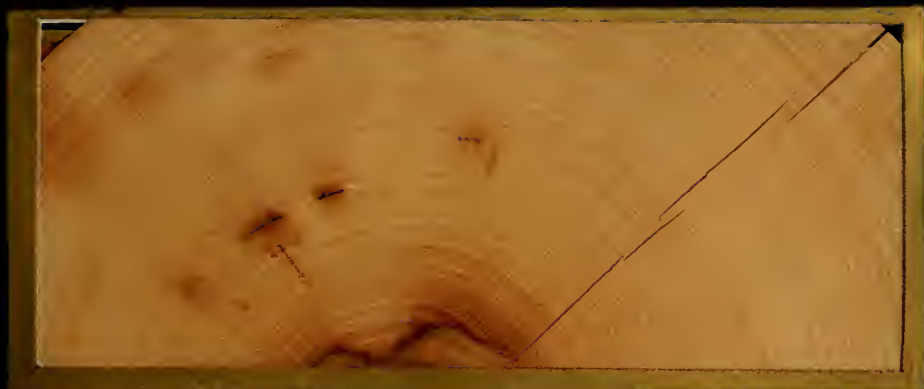
	Part.	No.		Part.	No.
<i>Quercus agrifolia</i>	VI	137	Spruce, Tide-land	VI	149
<i>alba</i>	II	38	White	IV	100
<i>aquatica (nigra)</i>	V	118	Sumach, Laurel	VIII	180
<i>bicolor (platanoides)</i> ..	III	66	Stag-horn	I	5
<i>Californica</i>	VII	162	Western	VIII	179
<i>chrysolepis</i>	VII	161	Sycamore, Arizona	X	232
<i>coccinea</i>	III	69	California	VI	135
<i>densiflora</i>	VI	138	Eastern, Plane-tree	I	13
<i>Douglasii</i>	IX	214	Tamarack (Hackmatack) East-		
<i>Emoryi</i>	X	234	ern	I	23
<i>Engelmanni</i>	IX	215	Western	X	250
<i>Garryana</i>	VI	136	<i>Taxodium distichum</i>	V	119
<i>hypoleuca</i>	X	235	<i>Taxus brevifolia</i>	VI	144
<i>lobata</i>	VII	160	Thorn or Haw, Black	IX	210
<i>Macdonaldi</i>	IX	216	Cock-spur	IV	85
<i>macrocarpa</i>	II	39	Dotted.....	III	53
<i>Michauxii</i>	V	116	Green	IX	202
<i>Muhlenbergii (acumi-</i>			Scarlet	IV	86
<i>nata</i>).....	III	68	<i>Thuja gigantea (plicata)</i>	IX	220
<i>obtusiloba (minor)</i> ...	IV	92	<i>occidentalis</i>	I	24
<i>palustris</i>	IV	94	<i>Tilia Americana</i>	I	3
<i>Prinus</i>	III	67	<i>Titia</i> , Buckwheat-tree.....	V	108
<i>rubra</i>	I	15	Red, Leather-wood.....	V	107
<i>tinctoria (velutina)</i> ...	IV	93	Tobacco-tree, Wild Tobacco..	VIII	188
<i>tomentella</i>	VIII	191	Toothache Tree.....	I 8	V 106
<i>virens (Virginiana)</i> ..	V	117	Torreya, Cal., False Nutmeg.	VI	145
<i>Wislizeni</i>	VIII	192	Fla., Stinking Cedar	V	120
Redwood, Coast	VI	143	<i>Torreya (Tumion) Californica</i>	VI	145
Giant or Mountain..	VI	142	<i>taxifolia</i>	V	120
<i>Rhamnus insularis</i>	VIII	176	<i>Tsuga Canadensis</i>	I	21
<i>Purshiana</i>	VI	126	<i>heterophylla</i>	IX	223
<i>Rhododendron Californicum</i> ..	VII	158	<i>Pattoniana</i>	VII	171
<i>Rhus integrifolia</i>	VIII	179	Tupelo	I	9
<i>laurina</i>	VIII	180	Sour	V	110
<i>ovata</i>	VII	153	<i>Ulmus Americana</i>	II	33
<i>typhina (hirta)</i>	I	5	<i>fulva</i>	I	11
<i>Ricinus communis</i>	VIII	189	<i>racemosa</i>	II	34
<i>Robinia Pseudacacia</i>	IV	80	<i>Umbellularia Californica</i>	VII	159
Saguaro, Suwarro	X	228	<i>Vitis aestivalis</i>	IV	78
<i>Salix alba</i> , var. <i>vitellina</i>	II	46	Walnut, Arizona.....	X	233
<i>laevigata</i>	VI	140	Black.....	II	35
<i>lasiandra</i>	X	237	California	VIII	190
<i>lasiolepis</i>	VII	165	Mexican.....	X	233
<i>nigra</i>	II	45	Wattle, Green or Black	IX	206
<i>Nuttallii</i>	VIII	193	Silver or Black	X	227
<i>Sitchensis</i>	X	238	<i>Washingtonia filamentosa</i> ...	VIII	200
<i>Sambucus glauca</i>	VII	157	Wax-Myrtle, California	VII	164
<i>Mexicana</i>	X	229	White-wood, Tulip-tree.....	I	2
Sassafras	II	32	Willow, Black... ..	II	45
<i>Sassafras officinale (sassafras)</i> .	II	32	California Black....	VI	140
<i>Schinus Molle</i>	VIII	178	California White....	VII	165
Screwbean, Screw-pod	IX	205	Nuttall	VIII	193
<i>Sequoia gigantea</i>	VI	142	Peach-leaf	III	71
<i>sempervirens</i>	VI	143	Silky or Sitka.....	X	238
Shad-bush, Service-tree.....	III	59	Western Black.....	X	237
Shinglewood.	IX	220	Yellow	II	46
Silk-tassel Tree, Quinine-tree..	VI	131	“Willow” Desert or Flowering	VI	134
Sour-berry, Sour-wood.....	VIII	179	<i>Xanthoxylum Clava-Herculis</i> .	V	106
Spruce, Big-cone.....	VII	172	Yew, Pacific.....	VI	144
Black	I	20	Yucca, Tree.....	VII	175
Douglas.	VI	150	<i>Yucca arborescens</i>	VII	175
Engelmann.	X	247			





236. FREMONTODENDRON CALIFORNICUM (Torr.) Cov.

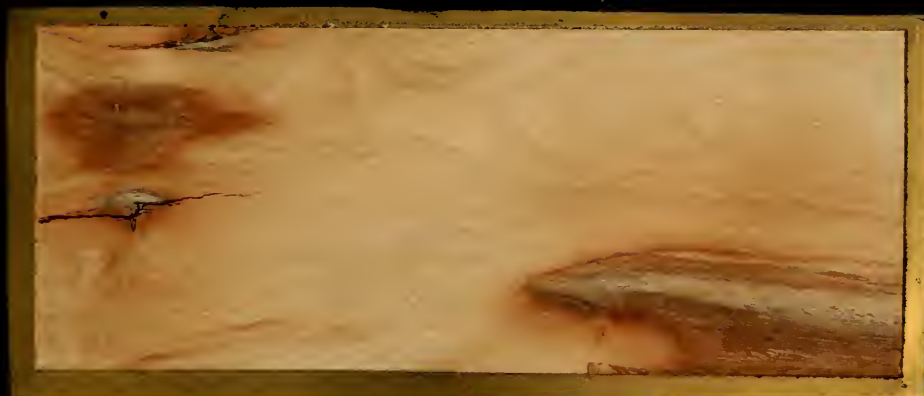
Fremontia, Cal. "Slippery Elm".



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Fremontia.

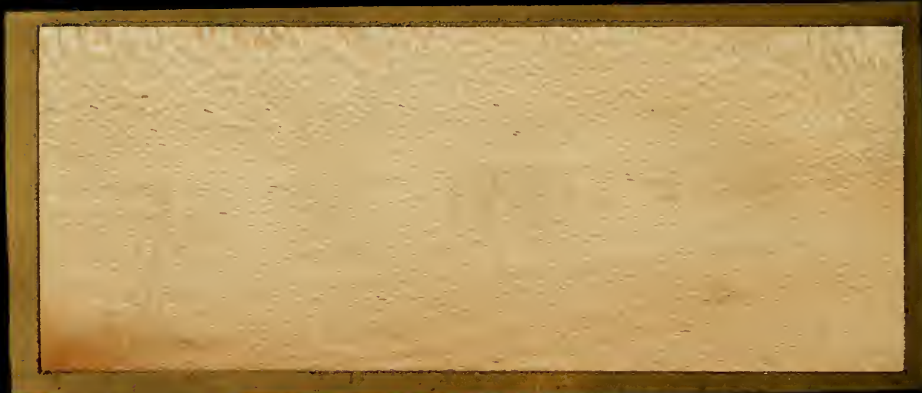
Fr. Fremontia.

Sp. Fremontia.

Fremontia, Cal. "Slippery Elm".



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Fremontia.

Fr. Fremontia.

Sp. Fremontia.

227. ACACIA MOLLISSIMA Willd.

Silver Wattle, Black Wattle.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Silberige Acacie.

Fr. Acacia d'argent.

Sp. Acacia plateada.

227. ACACIA MOLLISSIMA Willd.

Silver Wattle, Black Wattle.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Silberige Acacie.

Fr. Acacia d'argent.

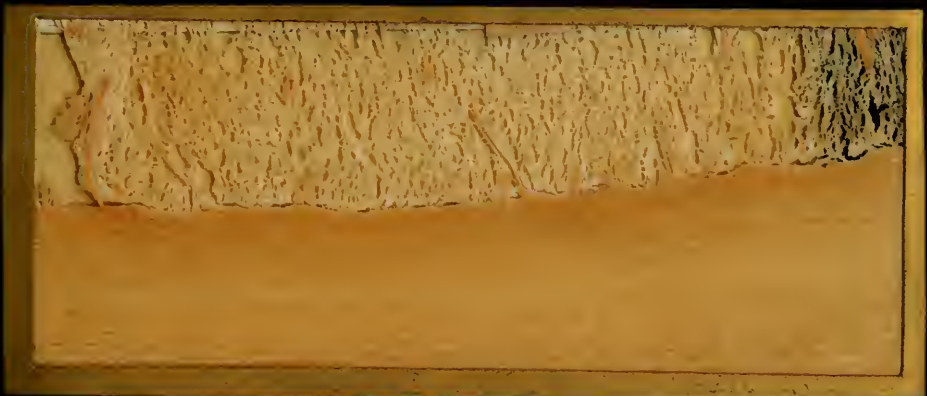
Sp. Acacia plateada.

228. CEREUS GIGANTEUS Engelm.

Saguaro, Suwarro, Giant Cactus.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Riesenecactus.

Fr. Cactus gigantesque.

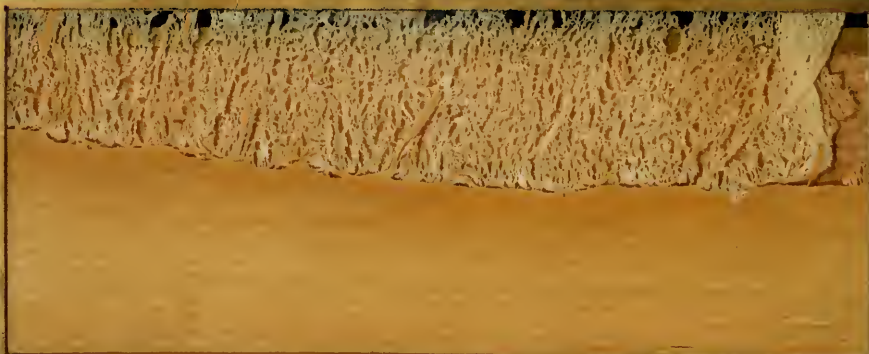
Sp. Saguaro.

228. *CEREUS GIGANTEUS* Engelm.

Saguaro, Suwarro, Giant Cactus.



TRANSVERSE SECTION.



RADIAL SECTION.



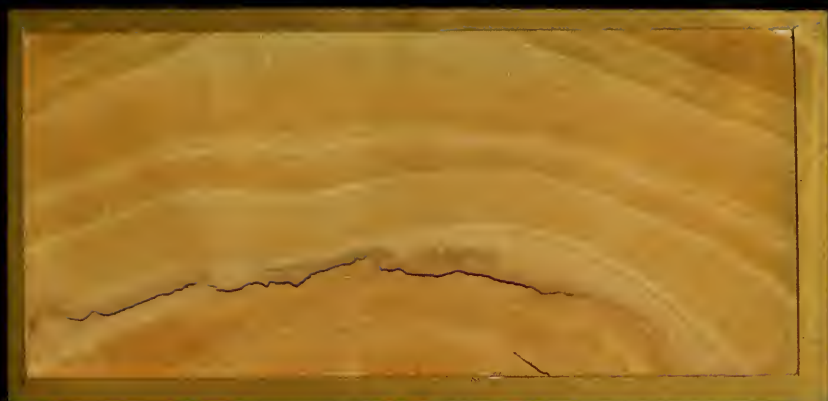
TANGENTIAL SECTION.

Ger. Riesencactus.

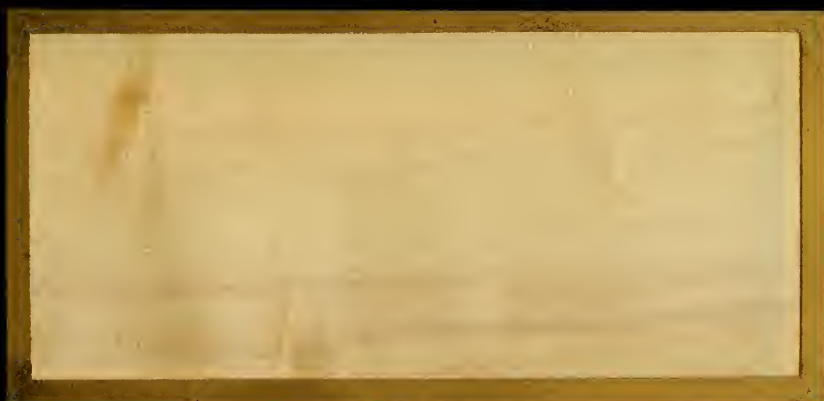
Fr. Cactus gigantesque.

Sp. Saguaro.

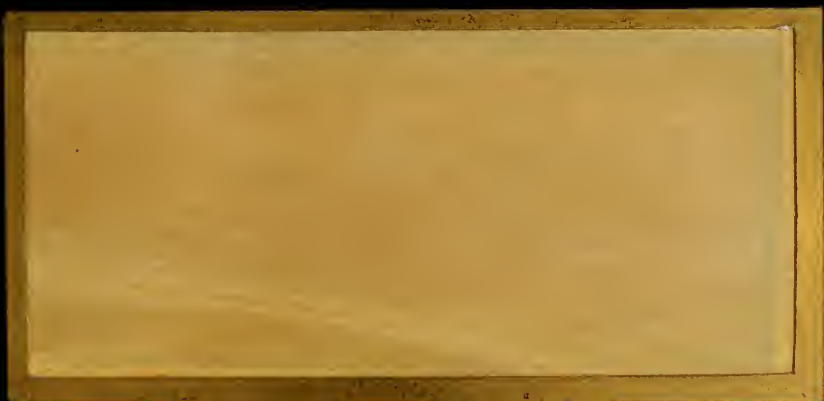
Mexican Elder.



TRANSVERSE SECTION.



RADIAL SECTION.

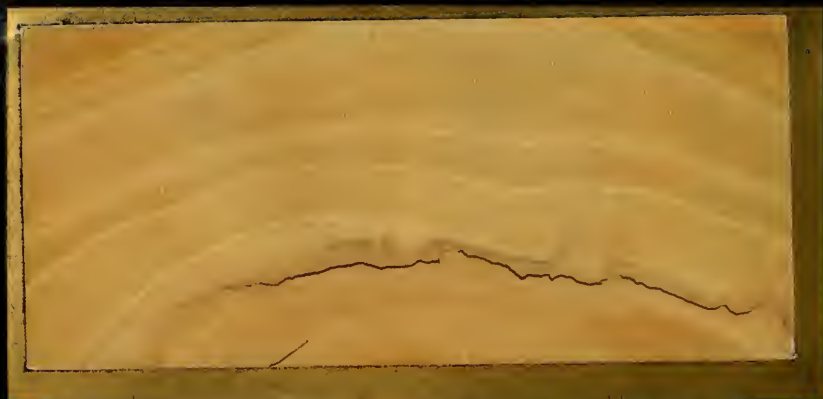


TANGENTIAL SECTION.

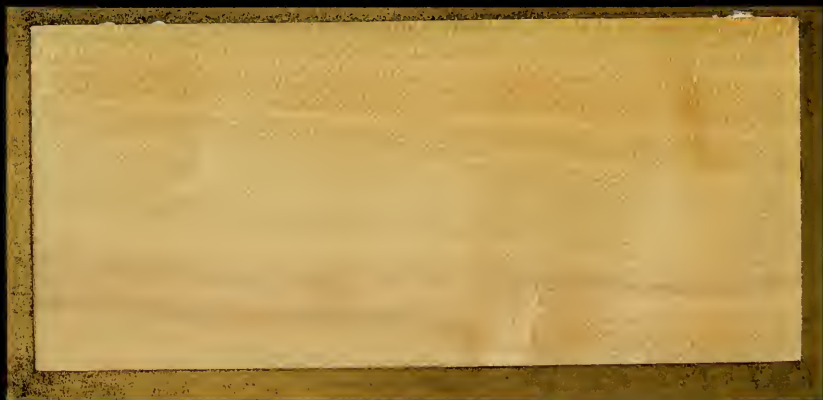
Ger. Mexicanischer Holunder. Fr. Sureau de Mexico.

Sp. Sauco de Mexico.

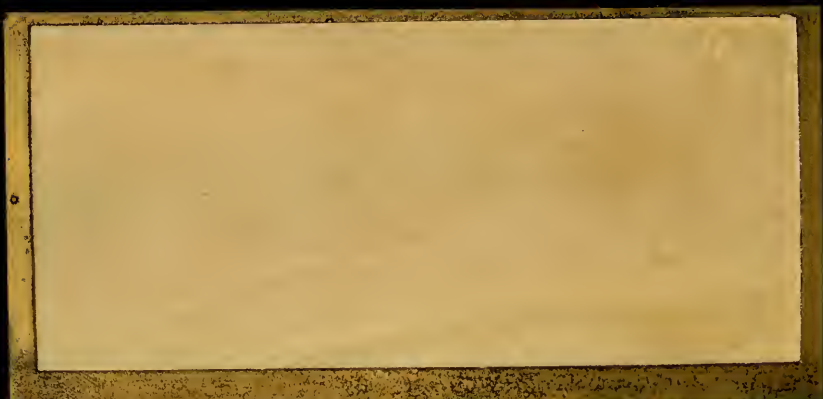
Mexican Elder.



TRANSVERSE SECTION.



RADIAL SECTION.



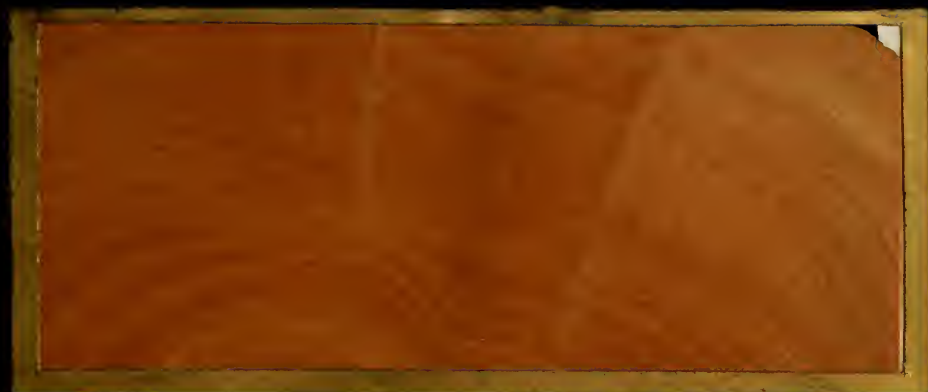
TANGENTIAL SECTION.

Ger. Mexicanischer Holunder. Fr. Sureau de Mexico.

Sp. Sauco de Mexico.

230. ARBUTUS ARIZONICA (Gray) Sarg.

Arizona Madroña.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Arizonischer Erdbeerbaum. Fr. Arbousier d'Arizona.

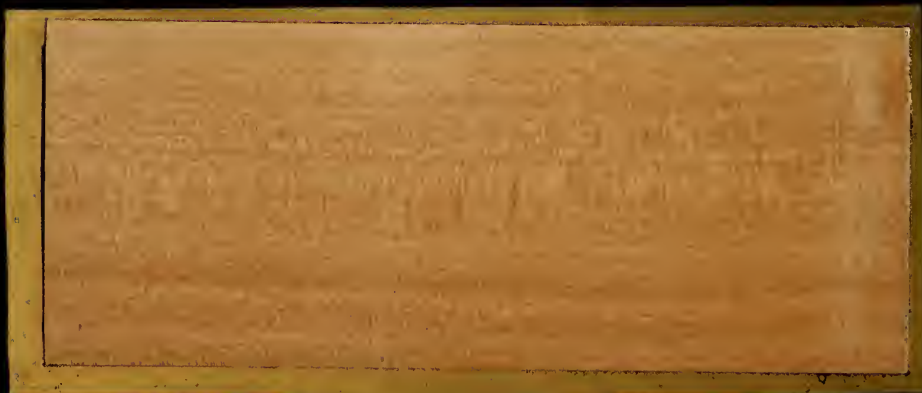
Sp. Madroña de Arizona.

230. ARBUTUS ARIZONICA (Gray) Sarg.

Arizona Madroña.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

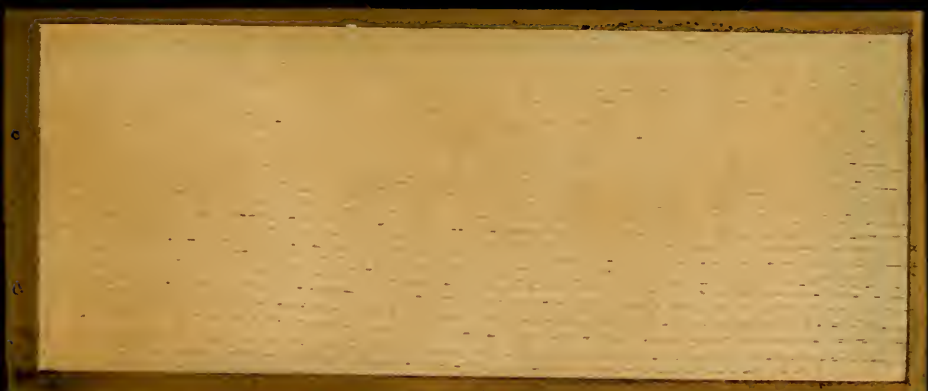
Ger. Arizonischer Erdbeerbaum, Fr. Arbousier d'Arizona,

Sp. Madroña de Arizona.

Fringe-flower Ash.



TRANSVERSE SECTION.



RADIAL SECTION



TANGENTIAL SECTION

Ger. Fransenblühende Esche, Fr. Frêne à fleurs de frange.

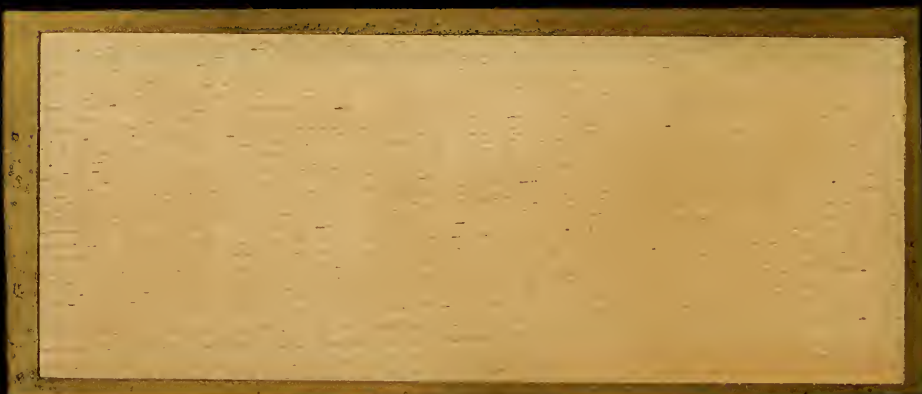
Sp. Fresno de flores de franja.

231. FRAXINUS DIPETALA Hook. & Arn.

Fringe-flower Ash.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Fransenblühende Esche. Fr. Frêne à fleurs de frange.

Sp. Fresno de flores de franja.

232. PLATANUS WRIGHTII Wats.

Arizona Sycamore.



TRANSVERSE SECTION.



RADIAL SECTION



TANGENTIAL SECTION.

Gen. Arizona/ebor Platana.

Fr. Platane d'Arizona.

Sp. Plátano de Arizona.

232. PLATANUS WRIGHTII Wats.

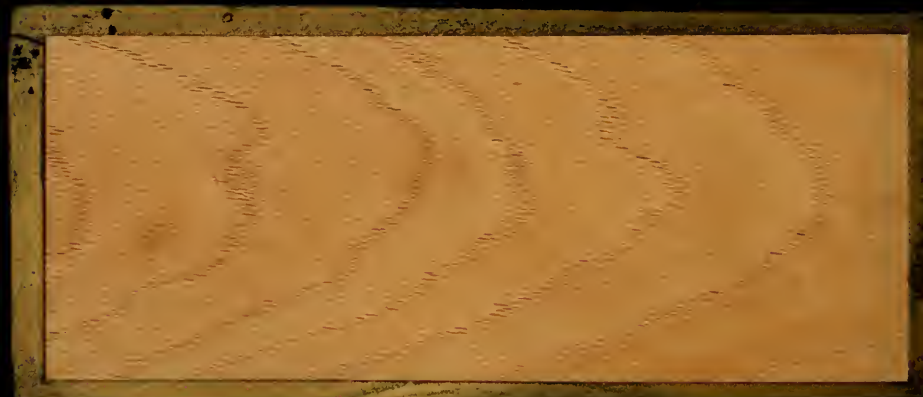
Arizona Sycamore.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Arizon'scher Platane.

Fr. Platane d'Arizona.

Sp. Platano de Arizona.

233. JUGLANS RUPESTRIS Engelm.

Mexican Walnut, Arizona Walnut.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Arizonische Walnussbaum. Fr. Noyer d'Arizona.

Sp. Nogal de Arizona.

233. JUGLANS RUPESTRIS Engelm.

Mexican Walnut, Arizona Walnut.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Arizonische Walnussbaum. Fr. Noyer d'Arizona.

Sp. Nogal de Arizona.

234. QUERCUS EMORYI Torr.

Emory Oak, Arizona Black Oak.



TRANSVERSE SECTION.



RADIAL SECTION.



LONGIT. SECTION

Gen. Emory and Torr.

Fr. Chêne d'Emory.

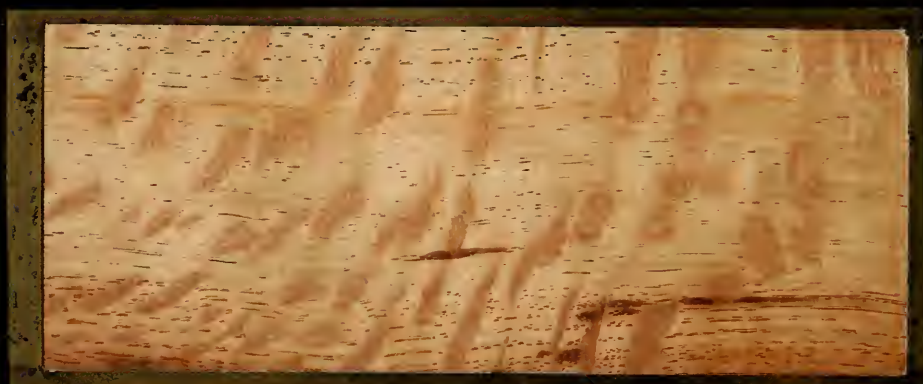
Fr. Rôle de Emory.

234. QUERCUS EMORYI Torr.

Emory Oak, Arizona Black Oak,



TRANSVERSE SECTION



RADIAL SECTION



TANGENTIAL SECTION

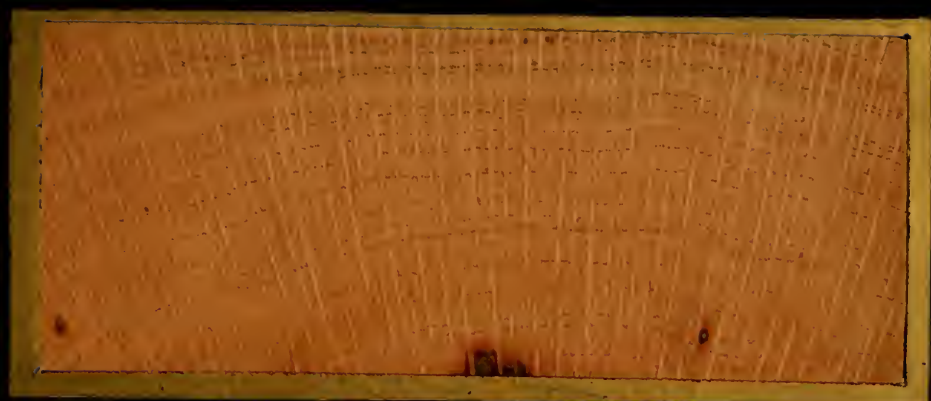
Ger. Eiche von Emory.

Fr. Chêne d'Emory.

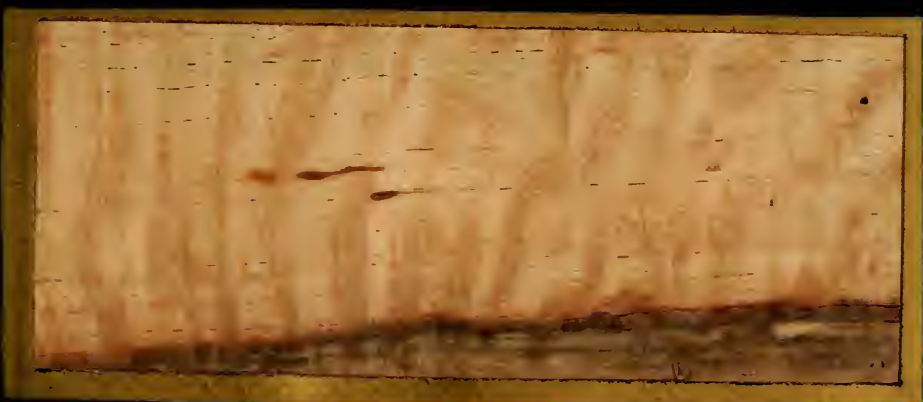
Sp. Roble de Emory.

235. QUERCUS HYPOLEUCA Engelm.

White-leaf Oak.



TRANSVERSE SECTION.



RADIAL SECTION.



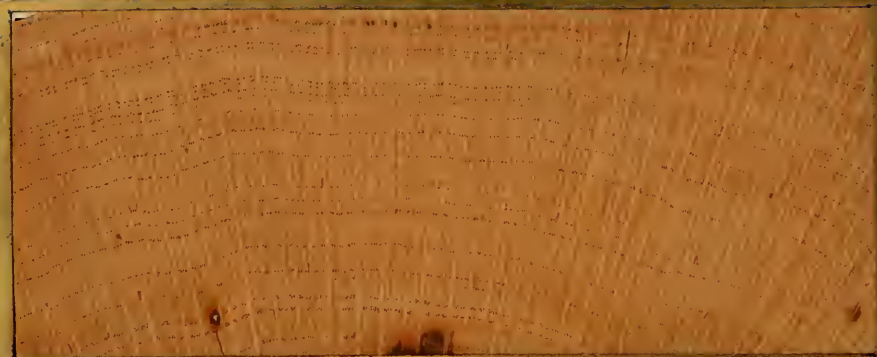
TANGENTIAL SECTION

Ger. Weiszblätterige Eiche. Fr. Chêne à feuilles blanches.

Sp. Roble de hojas blancas.

235. QUERCUS HYPOLEUCA Engelm.

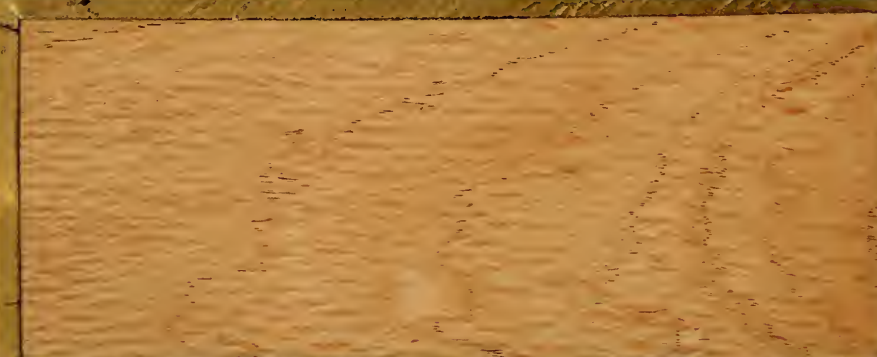
White-leaf Oak.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Weiszblätterige Eiche. Fr. Chêne à feuilles blanches.

Sp. Roble de hojas blancas.

236. BETULA OCCIDENTALIS Hook.

Western Birch, Puget Sound Birch.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Westliche Birke.

Fr. Bouleau occidental.

Sp. Abedul occidental.

236. BETULA OCCIDENTALIS Hook.

Western Birch, Puget Sound Birch.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Westliche Birke. Fr. Bouleau occidental.

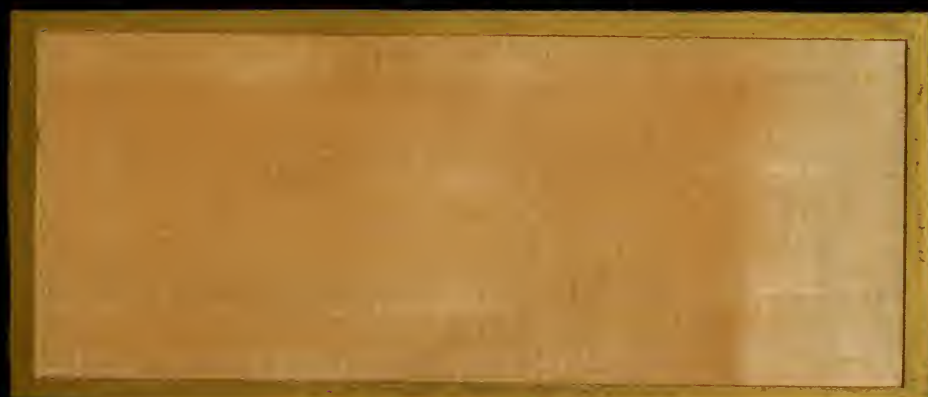
Sp. Abedul occidental.

237. SALIX LASIANDRA Benth.

Western Black Willow,



TRANSVERSE SECTION.



RADIAL SECTION.



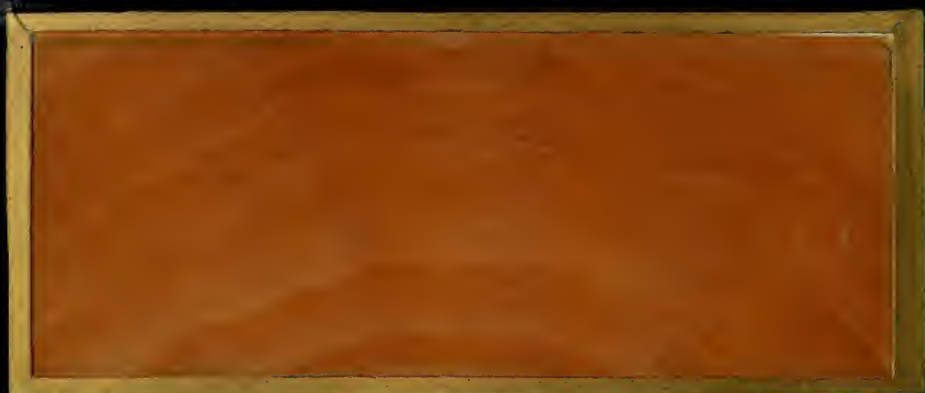
TANGENTIAL SECTION.

Ger. Westliche Schwarzweide. Fr. Saule noir occidental.

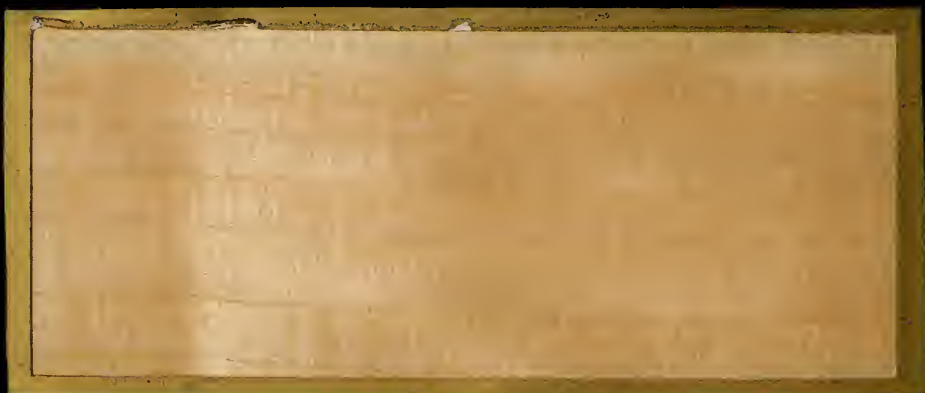
Sp. Sauce negro occidental.

237. SALIX LASIANDRA Benth.

Western Black Willow,



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger Westliche Schwarzweide. *Fr.* Saule noir occidental.

Sp. Sauce negro occidental.

238. SALIX SITCHENSIS Sans.

Silky Willow, Sitka Willow.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Weide von Sitka.

Fr. Saule de Sitka.

Sp. Sance de Sitka.

238. SALIX SITCHENSIS Sans.

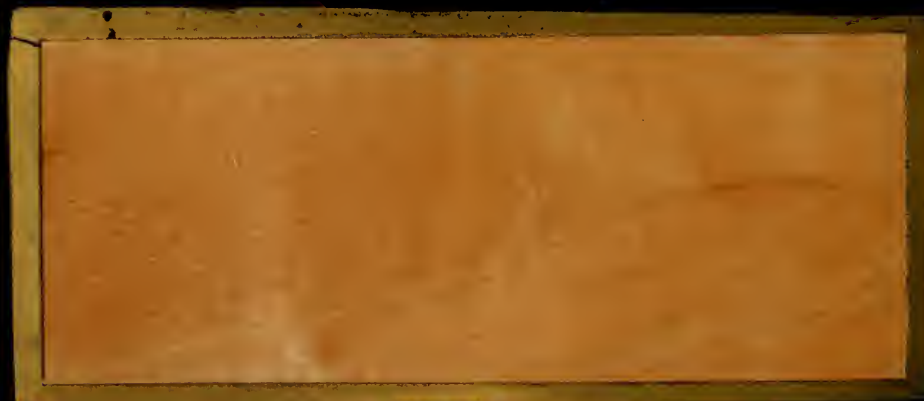
Silky Willow, Sitka Willow.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Weide von Sitka.

Fr. Saule de Sitka.

Sp. Sauce de Sitka.

239. CUPRESSUS ARIZONICA Greene.

Arizona Cypress.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Arizonische Cyprisse. Fr. Cyperess d' Arizona.

Sp. Cîprès de Arizona.

239. CUPRESSUS ARIZONICA Greene.

Arizona Cypress.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Arizonische Cyprsse. *Fr.* Cyperess d' Arizona,

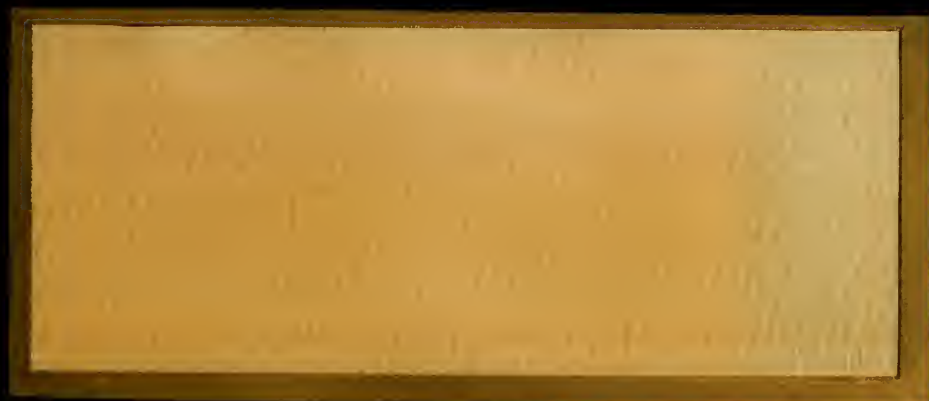
Sp. Ciprés de Arizona.

340. CHAMÆCYPARIS NOOTKATENSIS (Lamb) Spach.

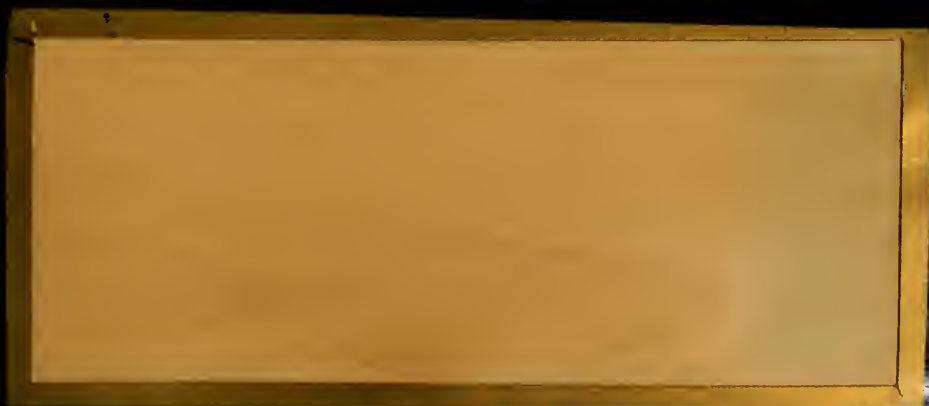
Alaska Cedar, Yellow Cedar, Sitka Cypress.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Gelbe Zeder.

Fr. Cedre jaune.

Sp. Cedro aramillo.

240. CHAMÆCYPARIS NOOTKATENSIS (Lamb) Spach.

Alaska Cedar, Yellow Cedar, Sitka Cypress.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Gelbe Zeder.

Fr. Cedre jaune.

Sp. Cedro aramillo.

241. CHAMÆCYPARIS LAWSONIANA (Murr.) Parl.

Port Orford Cedar, Lawson Cypress, Match-wood.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Cypresse von Lawson. Fr. Cypres de Lawson.

Sp. Cipres de Lawson.

241. CHAMÆCYPARIS LAWSONIANA (Murr.) Parl.

Port Orford Cedar, Lawson Cypress, Match-wood.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Cypresse von Lawson, Fr. Cypres de Lawson.

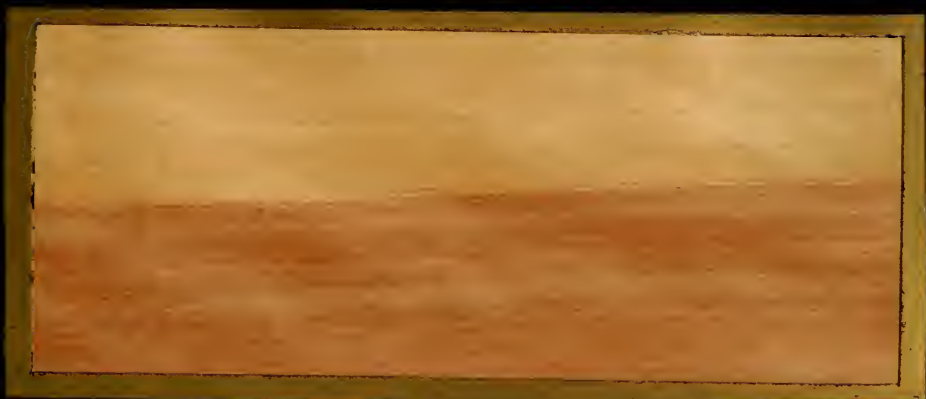
Sp. Cipres de Lawson.

242. JUNIPERUS PACHYPHLOEA Torr.

Alligator Juniper, Thick-bark Juniper.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Dickborke Wachholder. Fr. Genevrier à écorce épais

Sp. Enebro de corteza espesa.

242. JUNIPERUS PACHYPHLOEA Torr.

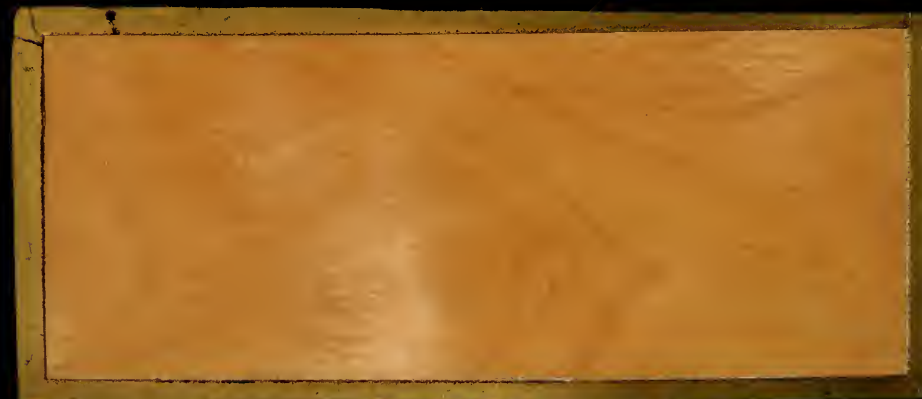
Alligator Juniper, Thick-bark Juniper.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Dickborke Wachholder. Fr. Genevrier à écorce épais

Sp. Enebro de corteza espesa.

243. PINUS FLEXILIS James.

Limber Pine, Rocky Mountain White Pine.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Biegsame Fichte,

Fr. Pin souple,

Sp. Pino flexible.

243. PINUS FLEXILIS James.

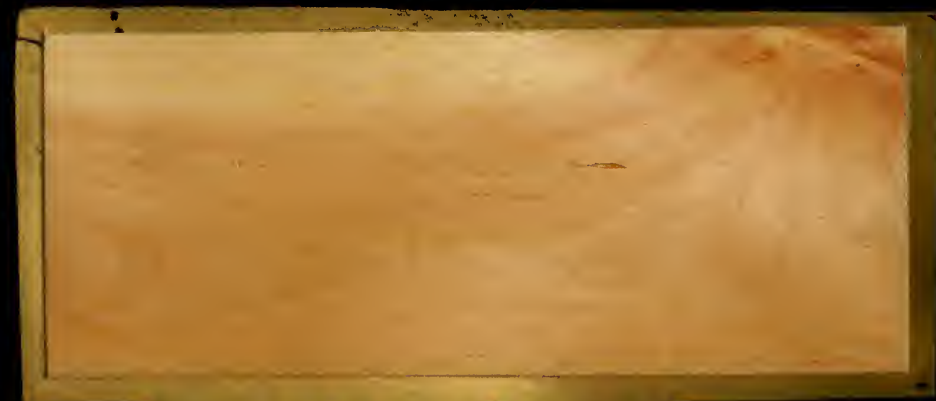
Limber Pine, Rocky Mountain White Pine.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Biegsame Fichte. Fr. Pin souple.

Sp. Pino flexible.

244. PINUS ALBICAULIS Engelm.

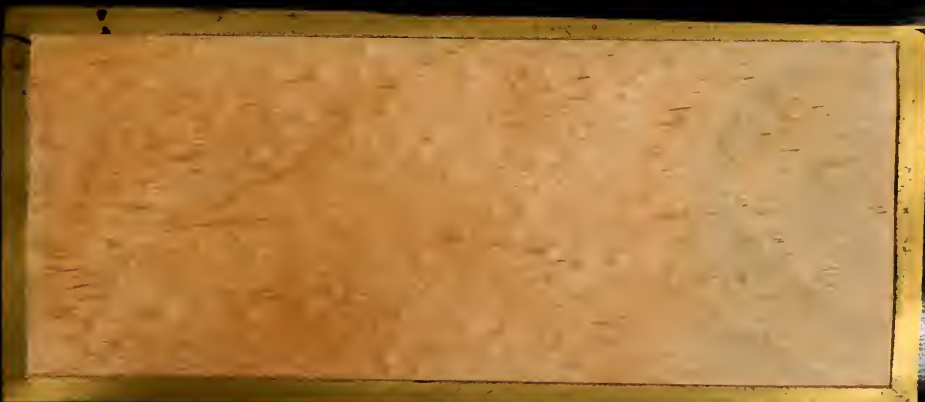
White-bark Pine.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Weissborke Fichte, Fr. Pin d'écorce blanc.

Sp. Pino de corteza blanca.

244. PINUS ALBICAULIS Engelm.

White-bark Pine.



TRANSVERSE SECTION.



RADIAL SECTION.



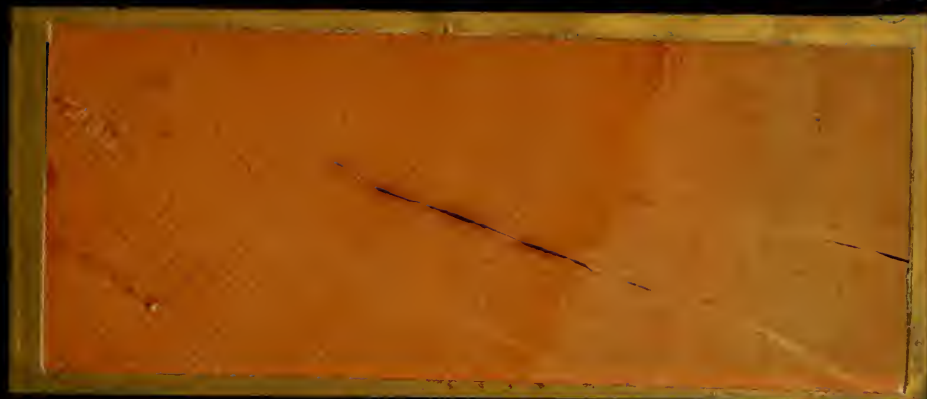
TANGENTIAL SECTION.

Ger. Weissborke Fichte. Fr. Pin d'écorce blanc.

Sp. Pino de corteza blanca.

245. PINUS QUADRIFOLIA Parl.

Parry Pine, Mexican Piñon or Nut Pine.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger Vierblättrige Fichte, Fr. Pin quadrifeuillier.

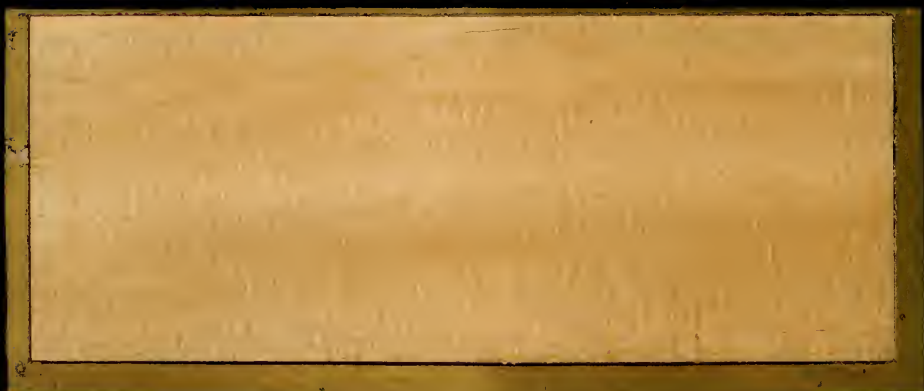
Sp. Pino de quatro hojas.

245. PINUS QUADRIFOLIA Parl.

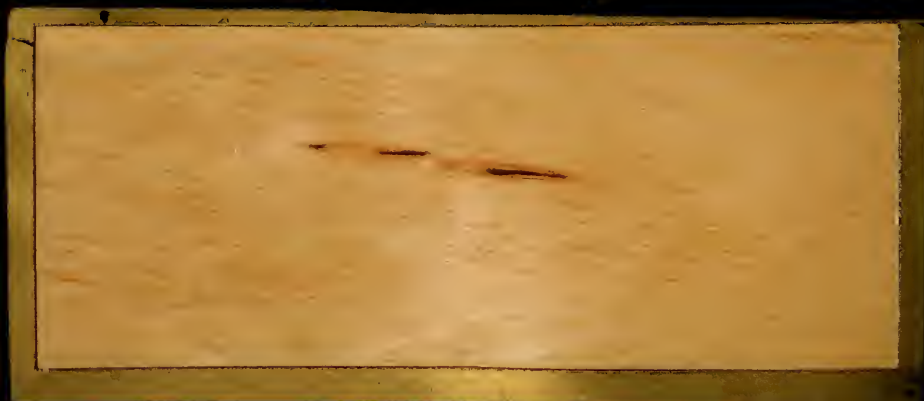
Parry Pine, Mexican Piñon or Nut Pine.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Vierblättrige Fichte. Fr. Pin quadrifeuillier.

Sp. Pino de quatro hojas.

246. PINUS BALFOURIANA Murr.

Foxtail Pine, Balfour Pine.



TRANSVERSE SECTION.



RADIAL SECTION.



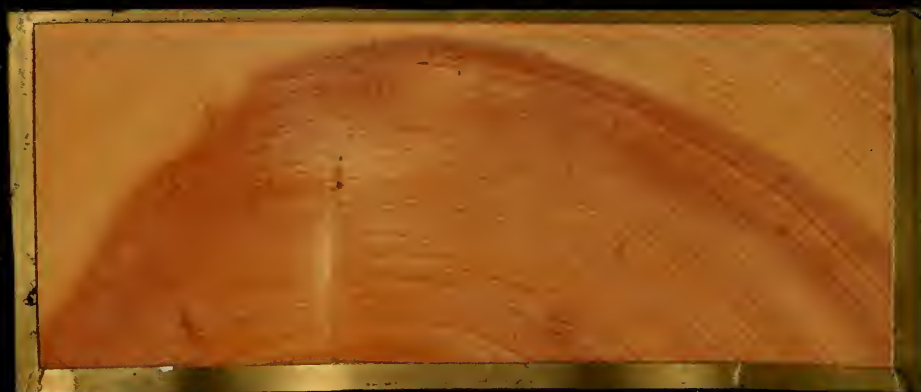
TANGENTIAL SECTION.

Ger. Fuchsschwanzige Fichte. Fr. Pin de queue de renard.

Sp. Pino de cola de zorra.

246. PINUS BALFOURIANA Murr.

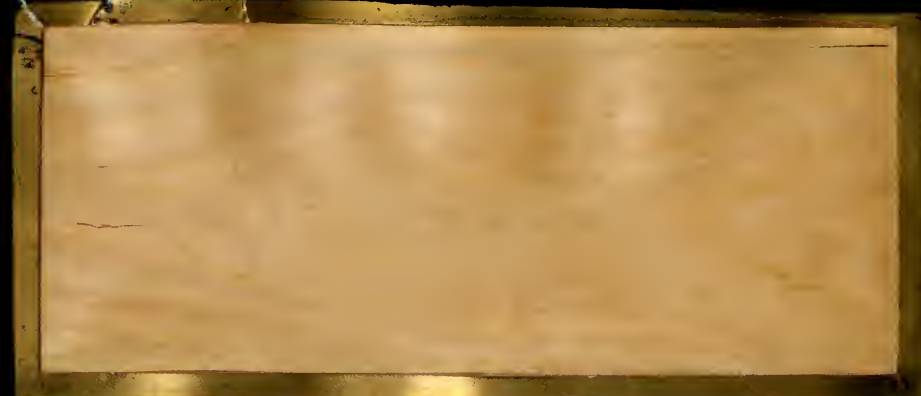
Foxtail Pine, Balfour Pine.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION

Ger. Fuchsschwanzige Fichte. Fr. Pin de queue de renard.

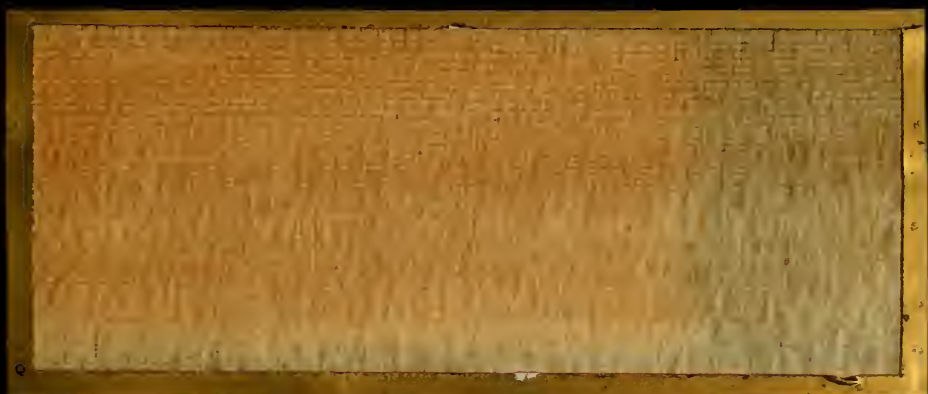
Sp. Pino de cola de zorra.

247. PICEA ENGELMANNI Engelm.

Engelmann Spruce, Rocky Mountain Spruce.



TRANSVERSE SECTION.



RADIAL SECTION.



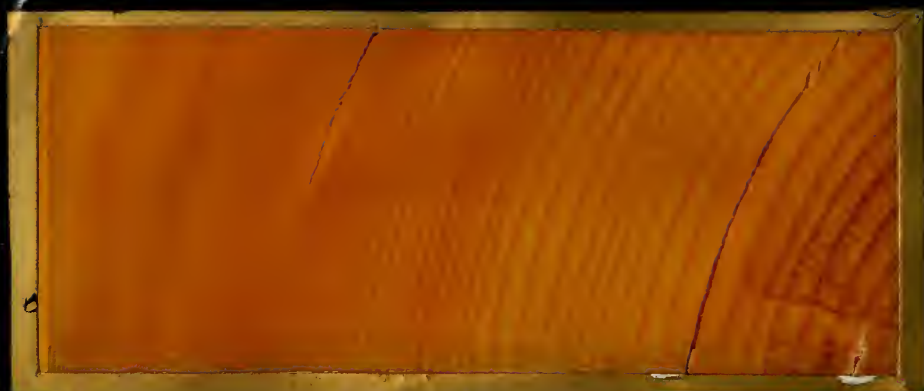
TANGENTIAL SECTION

Ger. Tanne von Engelmann. Fr. Sapin d'Engelmann.

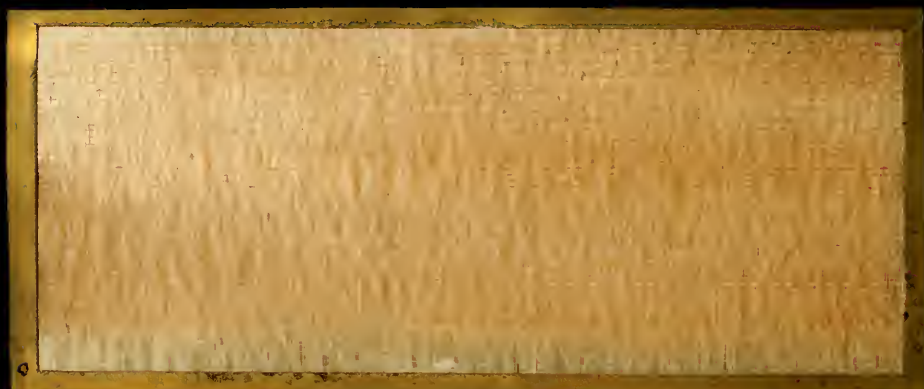
Sp. Abeto de Engelmann.

247. PICEA ENGELMANNI Engelm.

Engelmann Spruce, Rocky Mountain Spruce.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Tanne von Engelmann.

Fr. Sapin d'Engelmann

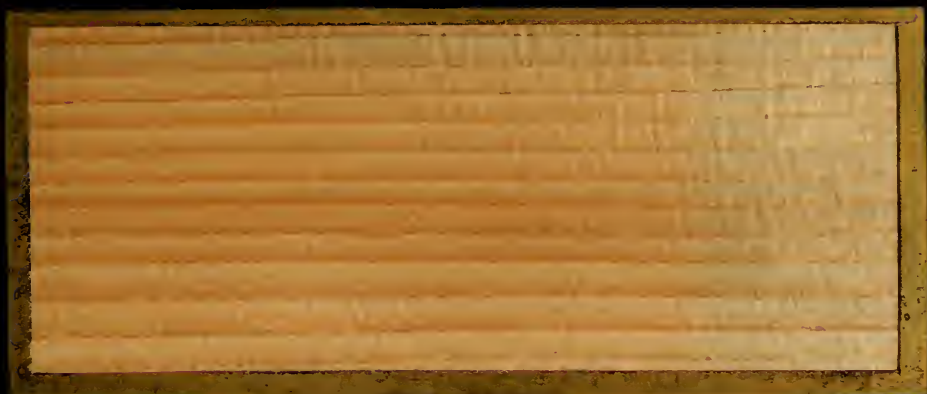
Sp. Abeto de Engelmann.

248. ABIES VENUSTA (Dougl.) Koch.

Bristle-cone Fir, Santa Lucia Silver Fir.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Tanne von Santa Lucia. Fr. Sapin de Santa Lucia.

Sp. Abeto de Santa Lucia.

248. ABIES VENUSTA (Dougl.) Koch.

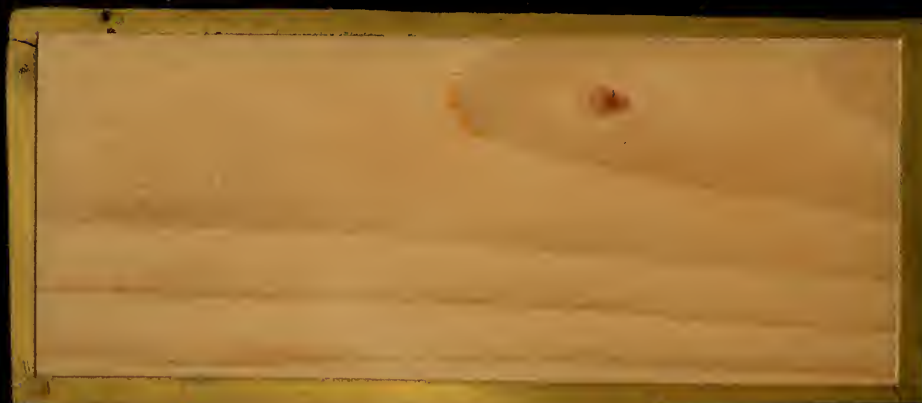
Bristle-cone Fir, Santa Lucia Silver Fir.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Tanne von Santa Lucia. Fr. Sapin de Santa Lucia.

Sp. Abeto de Santa Lucia.

249. ABIES AMABILIS Forb.

Amabilis Fir, Red Silver Fir.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Holdselige Tanne. Fr. Sapin aimable.

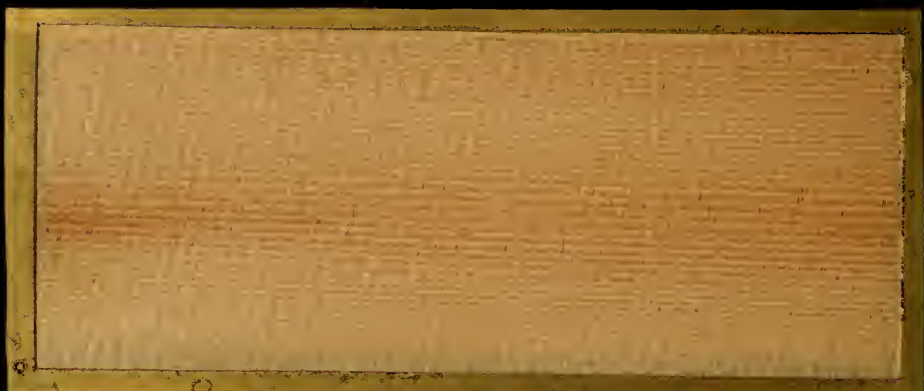
Sp. Abeto amable.

249. ABIES AMABILIS Forb.

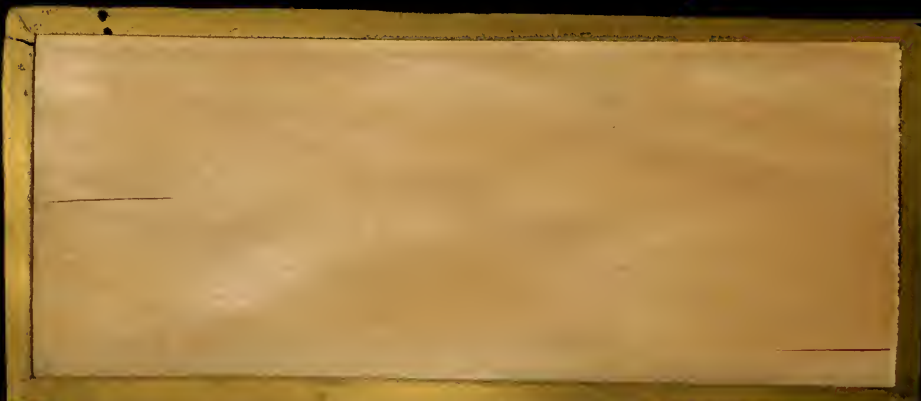
Amabilis Fir, Red Silver Fir.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Holdselige Tanne. Fr. Sapin aimable.

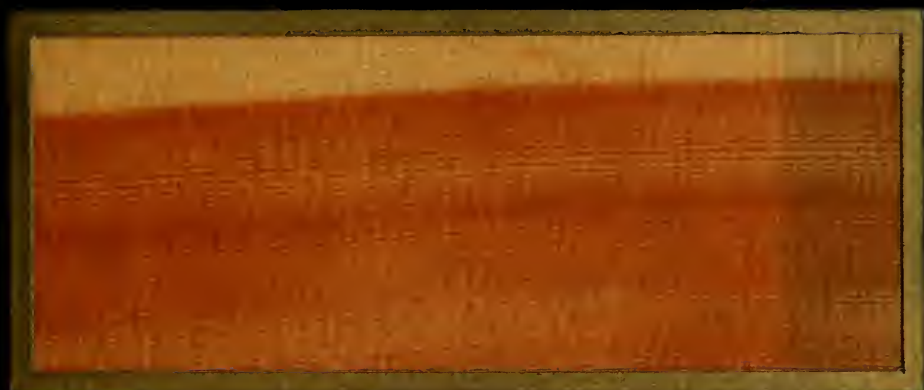
Sp. Abeto amable.

250 LARIX OCCIDENTALIS, Nutt.

Western Tamarack. Larch or Hackmatack.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Westliche Lärche; Fr. Meleze Occidentale;

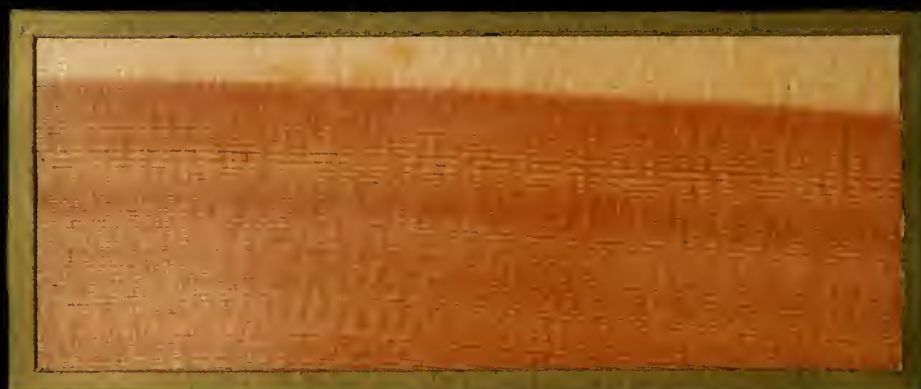
Sp. Larice Occidental.

250 LARIX OCCIDENTALIS, Nutt.

Western Tamarack. Larch or Hackmatack.



TRANSVERSE SECTION.



RADIAL SECTION.



TANGENTIAL SECTION.

Ger. Westliche Lärche; Fr. Meleze Occidentale;

Sp. Larice Occidental.



